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**Convention of Lighting Companies**

The four-day session of the Association of Edison Illuminating Companies at Cooperstown, N. Y., last week was remarkable in many respects. The attendance was greater than ever before, so that the family atmosphere which has always hovered about Edison conventions was rather attenuated. It is regrettable that the organization continues to hold its deliberations behind closed doors, because so much that is excellent is brought out and the papers are always of such a high order that the industry really loses valuable experiences that should be disseminated for the good of all. The Edison association is small so far as numbers go, seventy-three companies, we believe; but it wields an immense influence in the industry. One need not marvel at this when it is considered that these companies are located in the great marts and that they dominate in output of energy and in purchasing power. Their problems are the big and weighty ones of the industry, so that smaller central-station companies cannot hope to follow in the footsteps of the Edison companies in general matters of policy. However, the latest engineering information on lamps, meters, generating apparatus and distribution and transmission circuits is brought out at their sessions, which are, by and large, the finest of the industry, and this information, gathered oftentimes at no small expense, is of just as great value to the thousands of companies not in the Edison association. Some day, we hope, the guiding hands in the Association of Edison Illuminating Companies will be touched by the spirit of broad co-operation and will spread what information they can for the benefit of the entire central-station industry. Competition no longer exists in the lighting field, and there is nothing that partakes of the nature of a star-chamber proceeding in the doings of the Edison association. Is it wise, then, to suffer from the reflection to which secret sessions give rise?

**Our Electrical Customers Abroad**

Our highest hopes as to the development of electrical export trade have been realized in the figures given out recently as to the business of the year ended June 30. The statistical returns for June were very satisfactory, showing a gain from $1,783,102 to $2,314,732. For the whole year the total was $26,772,816, as compared with $20,169,362 in 1912 and $18,727,455 in 1911. It will be conceded that this shows a remarkable advance in electrical export trade, over which one might well become enthusiastic if it were not that the full measure of opportunity in this direction is far from being realized. As pointed out previously, the electrical industry is entitled to be credited with other items of an electrical nature, such as electric locomotives, or wire drawn and insulated for electrical purposes solely; but our main contention is correct, that swell the present figures as we may, the total is far below what it ought to be. There is, however, a recognition by manufacturers of the fact that a vast market exists abroad for our apparatus, and that American electrical goods find favor even under the adverse conditions that exist in many places owing to duties, lack of commercial connections, insistence on short credit here, and other features involved in holding old territory or opening up new. We can only regret once more that the present method of compiling these statistics in the United States Bureau of Foreign and Domestic Commerce prevents us from noting just where the goods do go, and in what volume. Such information is obviously of the highest value; but when out of nearly $27,000,000 of apparatus over $17,000,000 is lumped together as "all other," and no destination is given in the returns for any of it, helpful criticism or suggestion, based on such data, becomes practically impossible. The old statistics were extremely useful in showing exactly what the principal fields of consumption were and how they were varying from time to time.

**The Failure of "Home Rule"**

The failure of an effort, made principally by city officials of Seattle and Spokane, to obtain legislation at the last session of the Washington Legislature that would take away the regulative powers of the Public Service Commission over the utilities in those cities was discussed by Mr. Norwood W. Brockett in his paper before the Northwest Electric Light & Power Association. The same kind of an effort, made largely by officials of the city of Chicago, received the same treatment at the hands of the last Illinois Legislature. These movements attracted some unwarranted public sympathy because of the ease with which the politicians were able to attract a following when they raised the specious cry of "home rule." The local politicians had their chance at a "home rule" policy for public utilities during many years preceding the development of the modern practice of state regulation and they did not make it an effective or a safe policy. With a good law and able, fair-minded commissioners state regulation will yield the utmost in reasonable results to the public as well as to the companies. A state commission is, or should be, removed far enough from the controversy between a city and a corporation to judge without prejudice the merits of an issue between them. Control by a state commission has the approval of the general public, and both the public authorities and the companies should try in every way so

to meet the conditions of the new method that its efficiency will be a recognized factor in the security of our form of government. If the strength of state regulation is diluted or dissipated the eventual result will be that the public will show its hand again in public utility affairs in a firmer and less reasonable way.

## The Berlin Meeting of the I. E. C.

The second plenary meeting of the International Electrotechnical Commission, which has just been held at Berlin, has set a very permanent stepping stone in the advance of international electrotechnics. It was also well attended, since twenty-four countries were represented and seventy persons were present. Each of the special international sub-committees which had been working during the interval since the last meeting of the commission, in 1911, at Turin, was able to furnish a definite report on its subject, with the aid of deliberations held during the first three days of the Berlin meeting. In fact, the official plenary meeting, on the last day, became a mere ratification meeting, the report of committees being formally adopted and steps being taken for the continuation of their activities in the future. The results reached in the Berlin meeting are, therefore, in substance the aggregate results of the various sub-committees.

The nomenclature committee, under the chairmanship of Prof. S. P. Thompson, brought in an excellent report on the definitions of a number of technical terms frequently used in electrical engineering. The work of this committee is likely to be considerably extended in the future, since the German and Spanish languages are now admitted by the I. E. C.

The symbols committee, presided over by Dr. Karl Strecker, reported, among other recommendations, a list of thirty-six symbols representing electric and magnetic quantities for international use. This list comprises a number of quantities for which international symbols have never previously been agreed upon. The adopted list is now long enough to satisfy the needs of most electrical engineers for some time, and it is a matter for general and mutual congratulation that so much has been internationally accomplished in this direction. The prime-movers committee, of which Dr. Zoelly was chairman, brought in a report dealing especially with the specifications and nomenclature of hydraulic plants, in connection with electric generators, a field where standardization has been much needed.

Within the last few years the national laboratories of England, France, Germany and the United States have been coming into agreement on the international standardization of annealed copper for electrotechnical purposes. It is true that there was no very serious difference between the values of electrical conductivity taken as standard for copper wires in any of these countries, but there was just enough difference to keep the various national copper-wire tables distinctly apart. The four laboratories have recently come to an agreement on the matter, and Dr. Warburg, the president of the Physikalisch Technisches Reichsanstalt, communicated a report upon the values arrived at, which are also the basis of the new copper wire tables of the American Bureau of Standards. The result should be that all of the copper-wire tables issued hereafter in any country should be consistently in accord, and that a given sample of copper wire, tested in any country, should be found to possess the same percentage of standard conductivity.

The rating committee, under the presidence of Mr. E. Huber, also accomplished a considerable amount of work. Up to the date of the preceding meeting in Turin, very little had been accomplished by the I. E. C. in this direction, mainly because the way had first to be prepared by standardizing terms and methods of procedure. After a good deal of discussion, the rating committee adopted the fundamental principle of limiting the output of a dynamo-electric machine at a definite maximum permissible temperature, that of its hottest spot. Since the hottest spot in the armature of a machine is ordinarily at some part of the working conductor on the inside of the insulation, it is not practicable, at present, to measure this hottest-spot temperature, and reference has to be made to the highest accessible temperature, which is at some spot on the outside of the insulation, by allowing for a conventional drop of temperature in the insulating covering. Several of these maximum accessible temperatures were definitely adopted, such as 90 deg. C. for impregnated cotton insulation on machines up to an emf of 4 kv, the value recommended at the last A. I. E. E. midwinter convention in New York.

In order, however, to fix upon the international rating of a machine for continuous service, as the output which will finally raise the temperature of the machine to the accepted limit at the hottest accessible point, it becomes necessary to establish a conventional room temperature, or ambient temperature of reference. Thus, with 90 deg. C. as the maximum accessible limit, if the conventional reference ambient temperature were taken as 40 deg. C., the international rating of the machine would be the output that would ultimately raise its temperature by 50 deg. C.; whereas if the reference temperature were 30 deg. C., the international rating would be the output that would ultimately raise its temperature by 60 deg. C. It is clear that the lower the reference ambient temperature is taken, the larger becomes the corresponding temperature rise and the consequent international rating. In cases, however, where a machine is set to operate at a temperature higher than the assumed international reference temperature, the available output becomes less than the international rating, or the machine has to be temporarily derated, and the user must be cautioned against exacting the international rating load. On the other hand, when the machine works at a temperature below the international reference temperature the load on the machine may be safely increased above that of the international rating.

It was found impossible at Berlin to reach an international consensus of opinion as to what the reference ambient temperature should be. The large majority of the delegates appeared to be in favor of 40 deg. C., as recommended at the A. I. E. E. midwinter convention, but two countries held out for 35 deg. C. Since 40 deg. C. is a common summer ambient temperature in many rooms

where machines have to be operated, it is clear that such machines would not have to be derated, or reduced in load, if the accepted reference temperature were 40 deg. C., but would have to be derated if the reference temperature were 35 deg. C. The whole question of reference temperature, and the international rating dependent thereon, was therefore referred back to the national committees for further consideration, with a view to taking the matter up again in 1915.

President C. O. Mailloux, of the American national committee, extended the invitation to hold a meeting of the I. E. C. and an International Electrical Congress at San Francisco in 1915 and, with his linguistic talents, greatly aided the technical sessions of the commission over which he presided. The invitation, originally communicated by President Dunn for the A. I. E. E. in 1911 at Turin, was cordially received, and we may all hope that a large and representative delegation of electrical engineers, from many parts of the world, will convene at San Francisco two years hence. It was unfortunate that President Budde, of the I. E. C., was prevented by indisposition from presiding in Berlin, but the German reception committee did all in its power to make the session a memorable one.

## The Return Must Attract Capital

In a paper read before the Northwest Electric Light & Power Association, mentioned in last week's issue, Mr. George A. Lee quoted the "chairman of a certain Public Service Commission in one of the Mississippi Valley States" as saying that "in no event should capital invested in public service properties be entitled to a greater net return than 2 per cent." Mr. Lee replied that the courts and the commissions had held almost universally that any net return under 6 per cent was unreasonable, confiscatory and unconstitutional. To this the commissioner naïvely retorted that the courts and commissions were wrong.

The name of the commissioner who thus revealed unfitness for his responsible office is unknown to us. That he lacks worldly experience, business judgment and the necessary fairmindedness to pass upon questions affecting public utility companies is clear. If he had ever enjoyed the benefit of banking experience, he would have known that a lender obtains all the interest he can get consistent with the protection of his principal, and that a return of 2 per cent is not enough to tempt a lender to take the risks of fixed investment in a public utility plant. If he had been a borrower, even on the best collateral, he would have looked in vain for a capitalist who would accept 2 per cent on a long-term loan. If he had been a silent, unidentified investor, he would know that a 2 per cent rate would not attract his capital into public utility stocks or bonds. If he has any appreciation of the facts we have indicated, his absolute disregard of them is amazing and it indicates that he has not that open mind with which he ought to approach issues raised before him as arbitrator. If the commissioner is merely inexperienced or was talking for effect, both the corporations and the public whose interests he should equally protect have a painful task before them to inculcate in him those elemental notions of business and just public policy which are so indispensable to a public service commissioner. The public will not be served by idle talk of a rate of return which will not induce capitalists to provide the facilities that the public wants.

## The Patent Situation

The address recently delivered before the American Bar Association by Mr. F. P. Fish, of Boston, is well worth careful reading by all who are interested in the movement for patent reform, whether or not they agree with his views. Regardless of partisanship, however, Mr. Fish's extended defence of a liberal patent system as one of the essentials to greatness as a nation commands admiration and ought to inspire a sober sense of responsibility in all who approach the question from any angle whatever. The original purpose of our patent system was the promotion of the industrial arts, and to that end a reward was held out to each individual who would make an invention, the reward consisting of the exclusive right to the application of the idea for a limited period, in return for making a complete public disclosure of it. The original intent was clearly that the inventor should have the reward for his work, but it has finally come to pass that the reward as a rule is obtained by others, at least in great measure, and the cases where the inventor reaps a fair share of the profit are exceptional. This is perhaps the most serious indictment of our patent system as it stands to-day. Another important aspect is the relation of the system to the upbuilding and control of monopolies. The second phase is the one which undoubtedly lies behind the present efforts to pass legislation in Congress more than any abstract desire to restore inventors to a plane of substantial security in their rights under the original intent of the law.

The desirability of striking through the patent law at evils resulting from monopoly may be debatable, but it would seem sound nevertheless to lay down the precept that a wholly adequate reward may be conferred upon a patentee without bestowing upon him immunity from the anti-trust law. The Oldfield proposal for compulsory license is obviously a stroke at the evils which would result from monopoly or substantial monopoly of all the leading or controlling patents of any given art. By some it is held that all situations of such a character, so far as they may be against sound public policy, are reachable through the present anti-trust law, although it remains for the Supreme Court to confirm this opinion. While no one supposes that the suppression of patented inventions has been going on in any extensive wholesale fashion, nevertheless it is one of the immediate tendencies which flow from monopoly of any art. But the question as to whether or not the public may be injured by such suppression is exceedingly complex, and undoubtedly there are cases and circumstances in which suppression is a valuable asset to an inventor. The circumstances, the purposes, the effects, of suppression are all to be taken into account, and the interests of all parties carefully weighed in the light of the facts, before it is possible to say whether suppression is accompanied by a harmful tendency or produces beneficial results.

# The News of the Week

**Activities and Events in the Electrical Field—Reports of Meetings—Commission Findings, Etc.**

## X-Rays as Light

*By Cablegram*

At the Birmingham meeting of the British Association for the Advancement of Science, Sept. 10 to 17, Dr. C. G. Barkla announced that he had established the fact that X-rays are the most extreme of the rays of light in the ultra-violet end of the spectrum. The velocity is the same as that of "light" within the range of experimental error. The spectral distribution was found to be uniform like fluorescence, and the absorption was found to follow a definite law for all substances. Dr. J. J. Thomson claimed that this discovery is among the greatest of the present generation. Dr. Ernest Rutherford remarked that the discovery has been confirmed by experiments with radio-active materials. Dr. W. Bragg estimated the wave-lengths of the rays to be less than one-thousandth of that of the ultra-violet light heretofore recognized as such.

## Program of Indiana Convention

Owing to the fact that the Public Service Commission of Indiana has come into existence since the last convention of the Indiana Electric Light Association this year's meeting of the association will be of unusual interest. The convention will be held in Indianapolis at the new Canoe Club on Sept. 24 and 25, although meetings of the committees on local arrangement and finance will take place at the Claypool Hotel at 2 p.m. on Sept. 23. President J. W. Robb, of Clinton, Ind., will deliver the opening address at the forenoon session of Sept. 24, and Mr. J. V. Zartman, the secretary-treasurer, will make his report. An address of welcome will be made by Hon. Samuel L. Ralston. Mr. Thomas Duncan, chairman of the Public Service Commission of Indiana, will deliver an address, as will Mr. James L. Clark, of the same commission. Mr. Halford Erickson, a member of the Railroad Commission of Wisconsin, is also down for an address.

Papers are scheduled as follows: "Physical Valuation," Mr. H. H. Crowell, Grand Rapids, Mich.; "Practice Before Commissions," Mr. H. Wherry, New York; "Rates," Mr. F. A. Newton, Jackson, Mich.; "Electric Heating," Mr. J. S. Staudt, Purdue University; "Problems of Insurance," Mr. L. T. Block, St. Louis. There will be an accounting session in charge of Mr. Fred L. Dennis, of South Bend, and for the evening of Sept. 24 a banquet is scheduled, to be followed by a vaudeville entertainment.

## Pittsburgh I. E. S. Convention Arrangements

The general convention committee of the Illuminating Engineering Society has issued an unusually attractive souvenir program in connection with the seventh anuual convention to be held at Pittsburgh, Pa., from Sept. 22 to 25. There will be both morning and afternoon technical sessions on Monday, Sept. 22, and Thursday, Sept. 25. On Tuesday and Wednesday there will be only one session, in the morning, the afternoon on Tuesday being devoted to a trip to the works of the Westinghouse Electric & Manufacturing Company, and Wednesday afternoon being given over to baseball, tennis and golf. On Monday evening the reception and ball will be held at the Schenley Hotel. On Tuesday evening a lecture on the evolution of illumination will be delivered in the Allegheny County Soldiers' Memorial Hall, followed by a demonstration of the lighting effects in the auditorium. A banquet will be given at the Schenley Hotel on Wednesday evening. A theater party at the Grand Opera House has been arranged for Thursday evening. Both the banquet and the theater party will be complimentary to the visiting ladies. Numerous entertainment features, including visits to places of interest around Pittsburgh, have been provided for the ladies attending the convention.

Lists of the papers to be read and discussed at the convention were given on page 269 of our issue dated Aug. 9, and page 168, July 26.

Special trains will be run from Chicago and New York. The Chicago train will leave the La Salle Street station over the Lake Shore on Sunday, Sept. 21, at 8:20 p. m., arriving at Pittsburgh at 7:40 on Monday morning. The New York train will leave the Pennsylvania station on Sunday at 10:04 a. m., reaching Philadelphia at 11:57 a. m., Harrisburg at 2:35 p. m., and Pittsburgh at 8:50 p. m. on Sunday.

## Convention of I. and S. Electrical Engineers

For the seventh annual convention of the Association of Iron and Steel Electrical Engineers, to be held at the Hotel McAlpin, New York, from Sept. 22 to 27, the tentative program includes the following papers:

"The Selection and Operation of Carbon Brushes," by Mr. W. P. Boynton; "Alternating-Current and Direct-Current Magnetic Control," by Mr. M. A. Whiting; "Herringbone Gears for Steel Mills," by Mr. P. C. Day; "Direct-Current Turbo-Generators," by Mr. H. A. Rapelye; "Recent Developments in Switching Devices for Power Circuits," by Mr. T. G. Mahoney; "Design and Use of Lifting Magnets," by Mr. B. E. Fernow, Jr.; "Mercury-Vapor Quartz Lamp and Its Applications," by a representative of the Illuminating Engineering Society; "A Progress Report on Illumination," by Messrs. Ward Harrison and H. H. Magdsick; "Present Status of Electric Drive for Main Rolls," by Mr. Brent Wiley; "Questions on Motor Drives for Main Rolls," by Mr. E. Friedlander; "Variable-Speed Drives for Main Rolls of Steel Mills," by Mr. K. A. Pauly, and "Notes on the Present Status of Electric Furnaces," by Mr. Wilfred Sykes.

Two standardization meetings will be held on Friday, Sept. 26, one in the morning at 10 o'clock, at which Mr. F. D. Egan, chairman, will present reports of the standardization committee, which will include general specifications for (a) electric cranes, (b) power transformers and (c) automatic control, and another in the afternoon, at which will be discussed general specifications for (d) alternating-current direct-connected generators, (e) large alternating-current motors for roll-drives, and (f) motor-generators.

In conjunction with the association's convention the second safety congress of the National Council for Industrial Safety will hold meetings, as mentioned in our issue of Sept. 13, page 526.

## Pennsylvania Electric Association Convention

*By Telegram*

The sixth annual convention of the Pennsylvania Electric Association, state branch of the National Electric Light Association, opened at the Water Gap House, Delaware Water Gap, Pa., on Sept. 16 with a registered attendance of 298. The first session was given over to routine work and the address of the president, Mr. Van Dusen Rickert, of Pottsville. Mr. Rickert referred to the national progress of the industry and to the tendency toward centralization. Absorption, he said, will become more marked because with it goes stability of construction, operation organization and capitalization. Pennsylvania during the year had to meet the new thought of the people in regard to the control of public service corporations of all kinds. The legislation passed during the session just closed, he said, was vital to the lighting industry, and he contended that it was the duty of the companies to comply with the requirements. It should be the province of the association to see that the rulings be made plain and clear to the members.

Referring to the national body, Mr. Rickert expressed the opinion that its value will be found along lines other than those drawn at present. The state associations, because of commission regulation, must do the work as yet neither understood nor contemplated, and the national association must become the clearing house for the work of all the state associations. It will devolve on the national body to legislate and advise about matters brought to it from smaller self-governing integral parts which will send representatives to a central convention. The time will come, Mr. Rickert said, when conventions of the national body along present lines will be things of the past and a greater, broader National Electric Light Association will result. He suggested that papers for state meetings be chosen through competition so that merit may be encouraged. Mr. Rickert also suggested that the vital work of the association be compressed into two sessions so that those whose time is precious may leave without losing much of great value.

The features of Wednesday's sessions were the speeches of Mr. J. M. Wakeman, of the Society for Electrical Development, who outlined the aims and purposes of the organization, stating that its membership is now 575, of which 250 are central-station companies; Mr. J. B. McCall, president of the national association and also of the Philadelphia Electric Company, and Mr. Frederic W. Fleitz, a well-known attorney of Scranton. Mr. McCall briefly outlined the work of the national body, paying a tribute to the work of the state sections in cementing the relations of the various companies locally and making for closer and better understanding. He asked that the loyalty and support of the Pennsylvania Electric Association to the parent organization be continued. Tracing the early development of the industry, he said that the lessons learned from mistakes of the past might be divided into several classes, namely, financial, operating and business promoting. The errors made in the way of hastily or unduly considered investments, capitalization, etc., are errors likely to occur in the acts of the pioneers of any industry. The financiers look with grave doubt upon the industry as capable of profitable venture, and conditions of the industry are such that practically no economical basis can be found to justify the claim that larger investments would be justified by even comparatively small profits. Government authorities in almost every community have given little heed to the work which is being done which constantly adds to the value of the franchises and the convenience of the public served. It soon became apparent that the business was a practical monopoly and that duplication of stations and apparatus did not bring about the competition much desired and possible in ordinary industries, but resulted in combinations which in the main necessitated capitalizations that prevented both the stockholders and the public for some years from participating in the profits which would have been theirs from the start, had it not been for the mistaken idea of the benefits of competition, this being the promise invariably made as a lure to the free gift of franchises. Mr. McCall maintained that this era and these methods, for which the industry was not primarily responsible, did more than the attitude of the management toward the customer to bring about governmental regulation, and he felt satisfied that such regulation as to rates and service, coupled with protection to the industry and of just consideration of the rights of both parties, is acceptable and desirable to all parties concerned. The position of corporation managers has not been antagonistic to the law. They did not fear the passage of laws regulating their relations with the public, but they did fear the interpretations of such laws. It will depend on the companies how liberal that interpretation will be.

Mr. McCall referred at some length to the speech of Mr. Vanderlip at Association Island a short time ago, which was printed in abstract in these columns last week, as offering much of comfort to central-station managers. He said that only one out of every five investors seeks public utility securities, but that the bankers believe securities under governmental control are better than others.

The mistakes of engineering, Mr. McCall said, were due to the fact that the industry was meeting absolutely new conditions almost daily. The lesson to be learned is so to manage properties as to provide the surplus which will enable the company to make promptly the replacements that improvements in efficiencies render desirable. However, engineers must realize that there is a point where the colossal waste brought about by the early discarding of apparatus still useful will balance the economies expected from the newer apparatus. More mistakes have been made, however, and more lessons learned by past experience in the business-getting side of the industry. Lighting loads were looked upon as the most important and motor loads as by-products in the past, whereas now the lighting load is secondary to the motor load. The development of the business in a well-rounded manner was neglected chiefly because there were no commercial or business-getting departments and the engineering end overshadowed everything else. It soon became apparent that the industry would have to adopt the keen, aggressive business-getting and business-holding methods which had become almost a science in many other lines of trade. The lesson was a hard one to learn, but the industry profited by it. Recent statistics show an investment in electric supply companies not excluding electric railways of $2,500,000,000, which is more than the total capitalization of any one manufacturing industry in the country, excepting iron and steel. The combined capital of the central stations in the country has increased by 400 per cent during the past decade, and this has been accompanied by a 417 per cent increase in primary horse-power of installation in generating stations, indicating that the increase in capital is not merely an increased issue of stock. While the income from commercial lighting has increased by 226 per cent in ten years, the income from industrial motor circuits has increased 764 per cent. Mr. McCall closed with a reference to the great welfare work of the industry as a whole.

Mr. Fleitz spoke on utility regulation and gave some account of his work for the Pennsylvania Electric Association in guiding legislation in the recent utility bill enacted in Pennsylvania. The whole trend of modern life, he said, is away from individualism and toward collective community action, and this is bound to increase each year until many of the services now performed by individuals will be done, and done much better and cheaper, by a utility. This development and progress of public utility service has brought before the courts and the bar of that higher tribunal, public opinion, problems more in-

tricate and complex than any of those that confronted mankind fifty years ago, and one of the greatest of these is the question of regulation.

Mr. Fleitz believes that regulation of all public utilities has come to stay, and that the quicker the men at the head of the great public utilities realize this and accept it as one of the things with which they must deal the better it will be for the interests which they serve. He also believes that the sooner the public generally comes to understand that competition between public utilities is an economic fallacy which works out badly for both the utility and its customers the better the public interest will be served. The Supreme Court of the United States, in the case of Knoxville versus the Water Company, 212 U. S., handed down the opinion that:

"Regulation of utilities which perform their duties under conditions of necessary monopoly will occur with greater and greater frequency as time goes on. It is a delicate and dangerous function and ought to be exercised with a keen sense of justice on the part of the regulating body, met by a frank disclosure on the part of the utility to be regulated.

"The courts ought not to bear the whole burden of saving property from confiscation, though they will not be found wanting when the proof is clear. The legislatures and subordinate bodies, to whom the legislative power has been delegated, ought to do their part.

"Our social system rests largely upon the sanctity of private property, and that state or community which seeks to invade such rights will soon discover its error in the disaster which follows. The slight benefit to the consumer gained from a reduction in the rates charged by utilities is as nothing compared with his share in the ruin which would be brought about by denying to private property its just reward, thus unsettling values and destroying confidence. On the other hand, the utilities to be regulated will find it to their lasting interest to furnish freely the information upon which a just regulation can be based."

Mr. Fleitz said that the court here predicates the rate of regulation upon the natural monopoly of the business. There are, broadly speaking, three kinds of monopoly—artificial monopoly, produced by men and interests acting in combination and creating the so-called trusts; natural monopoly, being mainly utilities whose prior occupancy of the district precludes competition, and legal monopoly, created by law by the granting of patents or exclusive franchises. The grasping avarice and unreasonable conduct of many of the possessors of these monopolies in the very near past has created a public opinion antagonistic to the last degree against all monopolies irrespective of their merits, and indeed against almost all public utilities, without regard to the fairness of their management, until a situation has arisen which makes regulation and its protecting power as necessary to the utility as to the public which it serves.

Public opinion, he continued, when once formed is the most potent factor in the making and shaping of legislation and its interpretation by the courts. Legislators, jurors and judges are human, and they imbibe, are influenced by and are controlled by the opinions held by those with whom they associate. If regulation by properly constituted commissions will bring about, as it should, a better public opinion of the utilities which serve mankind, then regulation will prove a boon to the whole public-service world. When the public comes to realize, as it must, through the information disseminated by the commission, that the interests of the utilities and of itself are mutual, and that neither can prosper at the expense of the other, that the money invested in the great corporations is the money of the people generally, the present antagonism will give way to a more harmonious relationship between the two.

Mr. Fleitz also referred to the recent address of Mr. Frank A. Vanderlip, in which Mr. Vanderlip had estimated that to develop the electrical industry in the United States, so that it might keep pace with the increased demands made upon it, there would be required no less than $80,000,000 per week for five years, or $2,000,000,000 in all. The railroads during the same period will require $4,000,000,000 for refunding their debts and for fresh capital, while the cities and municipalities will absorb in their operations at least $1,500,000,000 more. In other words between now and the end of the year 1918 there will be needed for these three purposes between seven and eight billions of dollars, to say nothing of the enormous sums which will at the same time be needed for general industries and other things.

Capital is the most timid thing in the world, and has reason to be. It cannot be induced to enter a field where it will be constantly harassed by hostile forces. According to the speaker, men prominent in the management of utilities feel that regulation is interference with property rights. If the utility were purely a private business, they would be entirely right. The property itself is private, but the use to which it is put is public and the function of proper legal regulation is as much to preserve private property as it is to protect public right. The duty of the state to protect one is as sacred as its right to protect the other, and governmental power ought not to, and never can be, invoked to interfere with the control and management of private property. But it can and should be strong enough to see that the public use shall be fairly and equitably supplied. The great end to be sought by regulation is to see that private enterprises shall be left wholly free and unhampered to do their duty to the public with efficiency and fairness.

It ought to be generally understood and universally accepted among men that utilities are real necessities of mankind, that they are here to serve the needs of the people in a reasonable and businesslike way, and that they cannot do it, nor obtain the money to finance themselves, unless they are treated with fairness and reason, and established in public confidence. They cannot give good service unless generous opportunities and support are granted to them, and under proper and reasonable regulation they can be made quickly responsive to public sentiment and will give better service than any politically controlled, municipally owned utility in the world.

Speaking of the Pennsylvania utility bill and the commissioners appointed, Mr. Fleitz said he was satisfied that the Governor had acted wisely in the selection of the personnel and that they will prove to be reasonable, fair and impartial arbiters between the utility and the public, to the end that properly managed utilities shall prosper and the public shall participate in the benefits of that prosperity.

Abstracts of the papers read at the Delaware Water Gap convention, together with reports of the discussions they provoked, will be presented in a later issue.

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## Convention of Association of Edison Illuminating Companies

Some of the features of the thirty-fourth convention of the Association of Edison Illuminating Companies held at Cooperstown, N. Y., Sept. 8 to 12 inclusive were reported in these columns last week. Inasmuch as the Edison association meets in executive session, very little of what transpires reaches the general electrical public except what is released for publication. No discussion is ever released, because it is claimed the object of free and frank interchange of experience would be defeated by publicity.

The papers were arranged in groups. Those of the first session comprised chiefly committee reports and the president's address. The second session, held on the evening of Sept. 9 and presided over by Mr. C. L. Edgar, of Boston, was devoted to welfare work. Wednesday morning's session, the most important of all, was given over to a dis-

cussion of the lamp question, with Mr. Samuel Insull, of Chicago, in the chair. The afternoon session was taken up with reports and some papers dealing with rotary converters and load-factors. High-potential topics were discussed at the session on the morning of Sept. 11, and in the evening an address on the model public utility bill was delivered by Mr. E. W. Burdett, of Boston, who presided, preceded by a paper on the proper bases for valuations of public utility properties for purposes of rate making by Prof. D. C. Jackson. The seventh and final session, which was held on the morning of Sept. 12, was presided over by Mr. Louis A. Ferguson, of Chicago, and was devoted to a discussion of important steam matters.

A feature of the session on Thursday morning was the address of Prof. Elihu Thomson on "The Nature of Wireless Transmission." The speaker gave a very simple and lucid account of wireless transmission, beginning with transmission by wire and showing that as the frequency and voltage increase the copper conductor becomes more and more ineffective until at the enormous frequencies and voltages used in wireless transmission it can be dispensed with altogether. He said that the industry need never fear that wireless would ever supplant the present system for transmitting electrical energy.

At the Friday morning session Mr. S. E. Doane, of Cleveland, delivered an address on European practice to make the smallest possible customers profitable. Mr. Doane told of the cheap wiring which obtains in Germany and Italy and the exceptionally small returns from certain classes of customers. The latter are of the poorer working classes, and although the rate per kilowatt-year is very high, the income per customer in Milan is as small as 36 cents a month. Flat rates with a limiting circuit-breaker device prevail on such circuits. It was pointed out, however, that the class of building differs materially from that of this country and that the wiring does not meet the American standard. Most of the buildings are of stone construction in Europe, so that the wiring creates no greater fire hazard than that which it would cause if it were placed in an iron safe.

### Election of Officers

At the final session officers were re-elected as follows: President, Mr. Arthur Williams, of the New York Edison Company; vice-president, Mr. William Chandler, of the Edison Sault Electric Company, Sault Ste. Marie, Mich.; secretary, Mr. George C. Holberton, of the Pacific Gas & Electric Company, San Francisco, Cal.; treasurer, Mr. Louis A. Ferguson, of the Commonwealth Edison Company, Chicago, Ill.; executive committee, the officers above and Messrs. Charles L. Edgar, of the Edison Electric Illuminating Company of Boston; W. W. Freeman, of the Alabama Traction, Light & Power Company, Ltd., Birmingham, Ala.; Samuel Insull, of the Commonwealth Edison Company, Chicago, Ill.; John W. Lieb, Jr., of the New York Edison Company, and Joseph B. McCall, of the Philadelphia Electric Company.

### Entertainment Features

From the reception on the evening of Sept. 8 to the close of the convention entertainment features were provided for the ladies morning, afternoon and evening and for the gentlemen during the hours when no sessions were scheduled. The chief entertainment feature consisted of a vaudeville by professional talent in a huge tent on the hotel green on Sept. 10, followed by an exhibition of Edison educational and kinetoscopic pictures. A very pleasant function was made of the distribution of prizes about midnight of Sept. 11, General George H. Harries, of Louisville, officiating.

Following are abstracts of papers released in addition to the papers which were published in last week's issue of the *Electrical World*:

### High-Potential Disturbances

The report of the committee on high-potential disturbances, of which Mr. L. L. Elden, of the Edison Electric Illuminating Company of Boston, is chairman, dealt largely with subjects intimately connected with the elmination and prevention of failures of supply. Consideration was also given to various developments of protective apparatus which promise to meet most serious conditions. A step forward in this direction has been accomplished through the design of high-voltage generators of large ratings which eliminate the necessity for auto or step-up transformers in generating plants having pressures up to 15,000 volts. Practical applications of current-limiting reactors afford the most reliable evidence of their value, and the committee presented convincing testimony of their efficiency. There have been substantial developments in relay protective apparatus during the past two years, and a number of devices and methods of application are now available. These schemes, some of which are described in detail in the report, include the use of pilot-wire systems, split-conductor transmission lines, and devices for protection from lightning or accidental grounds and failure of generators, in all of which overhead and reverse power relays are employed to operate suitable switching devices to effect the disconnection of lines and apparatus when necessary.

No marked improvements in switching devices have been noted during the year, although experience with the reactor type of oil switch shows that the addition of reactance materially increases the ability of oil switches to break heavy currents. The committee again referred to earlier recommendations covering the rating of cables and emphasized the desirability of studying the possibilities of increasing the current-carrying capacity of certain classes of cables through recognition of temperature conditions. The committee also maintained that cable manufacturers should use every effort to improve the quality of all classes of cables, particularly those used for transmission service.

The success which has attended the construction of an experimental section of high-tension underground structure for transmission purposes justifies the hope that the present limitations of underground potentials will be removed through the successful development of some construction permitting operation at the higher voltages. The scheme described by the committee involves the use of standard iron pipe as the container, in which are assembled insulators so disposed around the pipe and so displaced laterally in it as to provide an independent support for each of the three-phase conductors and also allow the free passage of oil which is used as the fluid dielectric. According to the committee, the manufacturers are continuing to improve and modify lightning arresters to meet observed conditions. Extended experiments are now in progress on several important systems to determine if possible the conditions under which lightning arresters should be installed on distribution circuits to obtain the maximum protection and the greatest freedom from interruptions.

Improvements in the quality of porcelain used for insulating material may be anticipated as the result of most valuable research work on the methods and results obtained under present manufacturing conditions. Improvements of this character cannot fail to increase the reliability of overhead systems through the introduction of a larger factor of safety in insulating materials as has been the case in generating apparatus where mica has been more generally adopted for insulation. Reports of further progress in the improvement of 60-cycle rotary converters and their successful application to commercial service in situations previously considered as prohibitive will undoubtedly be of interest to operating companies having use for such apparatus. The committee also gave attention to the use of storage batteries for the protection of alternating-current systems and a study of a proposed installation described in the report bears evidence as to the feas-

ibility of the scheme. Whether it is advisable, necessary or warranted in any location must, of course, be determined by those interested in the supply of service.

### Load-Factor

The Consolidated Gas, Electric Light & Power Company of Baltimore succeeded in increasing its load-factor from 23 per cent in 1907 to over 50 per cent in 1912 and expects to improve this figure materially in the future. Mr. A. S. Loizeaux, after briefly examining the meaning and use of the term "load-factor," explained the methods used in obtaining this result. Four requisites for improving the load-factor of central-station companies were given as follows: (1) Prospective business in industrial or other motor load; (2) rates properly designed to attract business of high load-factor; (3) an adequate industrial engineering department; (4) adequate plant and equipment and facilities for special service to supply customers satisfactorily. When a contract has been obtained for electric service of large bulk it is generally necessary for the electric company's engineers to serve the customer in planning the distribution system, purchasing motors and equipment and installing the same. This service has been rendered at Baltimore in every large installation obtained, the company even going so far as to design and construct substations for customers and operate them until the customers were prepared to take over the installations. Work of this kind is done at actual cost, including overhead charges, and enables the customer to obtain a more satisfactory and economical installation than he otherwise could. A frequent means of obtaining desirable business is the ability to supply electricity during breakdown of a private installation. According to Mr. Loizeaux, several instances have occurred where energy was supplied within twenty-four hours of such breakdown, and the experience with electric service thus obtained induced the making of contracts with the electric company for permanent service.

### Industrial Electric Heating

A superficial examination of figures on the relative cost of heat as obtained from various sources shows that electricity for this purpose is hopelessly expensive, and in a paper by Mr. T. King, of the Consolidated Gas, Electric Light & Power Company of Baltimore, the three disadvantages of high cost, difficulty of obtaining thoroughly reliable heating elements of long life and unfamiliarity of the public are considered in connection with the eight advantages of control of the atmosphere surrounding substance heated, temperature attainable, portability, ease of thermal insulation, cleanliness, adaptability of automatic control, adaptation to intermittent work, and reduction of fire hazard. According to the author, there are hundreds of industrial processes where the advantages of electric heating outweigh the cost and where the processes cannot attain perfect results or truest economy until electric heating is applied. It is therefore the manifest duty of the central station diligently to seek out processes where electricity is truly the best source of heat and carefully to refrain from any attempts to apply electricity to processes for which it is not particularly adapted. It is also incumbent upon the central station to encourage the development of reliable, efficient devices and to educate and enlighten the public on their uses. The author expatiated on the advantages of electricity for heating purposes but offered no information on the industrial processes in which electric heating is essential to the process or to true economy.

### Circuit Protection

Mr. Paul M. Lincoln, of the Westinghouse Electric & Manufacturing Company, in his paper dealt with the general subject of protection against short-circuits, tracing the development of the various measures that have been used and proposing certain modifications of existing practices that seemed to him to be logical. He regarded circuit protection from two viewpoints, namely, protection to the apparatus and protection to the service, the latter being regarded by operators as being of more importance than the former. He said that the conditions which led to the use of reactors in generator leads were the prevention of damage to generator windings and the necessity of easing up on the then existing types of circuit-breakers, both of which conditions led to a protection of apparatus rather than a protection of service. Modern improvements both in the bracing of generator windings and in the enlargement of circuit-breaker capacity have removed these limitations so that the two main reasons which led to the adoption of reactors in generator leads have disappeared. According to Mr. Lincoln, reactors have an important function in the protection of service entirely apart from the use to which they were originally put in the protection of apparatus, and to fulfil this function properly they should be used on feeder circuits and in very important plants to sectionalize busbars rather than in the generator leads. He described in detail the method of bracing used in recent 60-cycle generators of approximately 20,000-kva rating which enabled the generator windings to withstand any short-circuit shock. A description was also given of a reactor type of circuit-breaker whose chief characteristic is that it divides the opposing forces into two or more sections and then ruptures them in detail. The first break is shunted by a suitable reactor which reduces the current to such a point that the second break can then interrupt the circuit without difficulty. The two breaks are carried by the same mechanism and the reactor forms a part of the circuit-breaker itself. So far as the manufacturing company can judge at present, station ratings will have to exceed anything yet proposed before it will be necessary to resort to more than two breaks in order to secure successful operation.

### Electric Drive in Selected Industries

Mr. R. H. Tillman, of the Consolidated Gas, Electric Light & Power Company of Baltimore, Md., presented a paper dealing with the engineering features and manufacturing processes in three classes of business, together with operating data of each plant. Direct-current and alternating-current ice-cream plants were described, as were a glass-bottle plant electrically equipped with special reference to the type of air compressor and motor drive, and the manufacture of acids and fertilizer by electricity. In general the paper showed how necessary it is for the central-station representatives to familiarize themselves not only with the engineering features but with the actual manufacturing processes of modern industries as well.

### Apparatus for Catching Cinders

As is well known, when coal is burned small particles of unconsumed carbon, dust and ash are carried away from the fuel bed and a portion of the so-called cinders is drawn up the stack and thrown out into the atmosphere. This creates not a smoke nuisance but a cinder nuisance, to correct which much time and money have been spent. Messrs. C. B. Grady and E. B. Ricketts described the latest apparatus for catching cinders which is at present being installed in the stations of the New York Edison Company. A movable damper located just beyond the boiler outlet deflects the products of combustion in a downward direction in the flue. At the bottom of the flue is a water tank in which is maintained about 1.5 ft. of water. The water is constrained to flow over a gutter and down the inside face of the damper into the tank. About 75 gal. of water per minute per boiler is thus circulated, and about 8 gal. per minute per boiler is added to make up for evaporation, etc. The gases leaving the boiler are deflected downward by a baffle plate and then pass down through a wedge-shaped duct, one side of which is formed by the movable damper and the other side by one of the sides of the flue. The duct is of uniformly decreasing cross-section and is

open at the lower end so that the direction of flow of the gases as they leave the duct is substantially vertical. In passing through the cinder catcher the gases are fanned out so that they leave the bottom of the catcher through a long narrow slot. The water level at the bottom of the flue is kept constant and at a comparatively short distance from the bottom of the movable damper. The water flowing over the edge of the gutter forms a sheet on the damper and a diminutive waterfall at the bottom. The cinders are either caught by coming in contact with the sheet of water on the movable damper or are projected into the water in the bottom of the flue by the comparatively high velocity that they have attained. This velocity is attained partly by the increase in the velocity of the gas current in which the cinders are suspended and partly by gravity. It is estimated that the cinders are projected toward the surface of the water with a velocity of about 50 ft. per second. The movable damper can be raised or lowered from the boiler-room floor through suitable mechanism, according to the load on the boilers. The cinder catcher does not reduce the boiler capacity materially. Results of a number of tests are said to show an average efficiency of 95 per cent.

### Steam Turbines and Auxiliaries

According to the committee on steam turbines, of which Mr. J. P. Sparrow, of the New York Edison Company, was chairman, there has been no radical change in the design of steam-turbine units or auxiliaries during the year. The present trend of turbine design from the manufacturers' point of view was presented in communications from the General Electric Company and the Westinghouse Machine Company which formed part of the report. A very complete description of the large horizontal turbine set purchased abroad by the Commonwealth Edison Company of Chicago was also given as an appendix. The end in view of the Commonwealth Edison Company has been to obtain the best possible over-all plant efficiency, and while the general arrangement of boilers, economizers, turbines and auxiliary machinery presents no radical departure from accepted practice, it embodies a completeness of detail which is new, at least in American practice. As to turbine auxiliaries, the committee says that continued demand for more efficient apparatus has been met by increased effort on the part of the manufacturers. Geared apparatus is looked on with growing favor since it enables the purchaser to secure the highest efficiency in the driven apparatus with the correct turbine speeds for minimum steam consumption. Many practical and efficient gearing devices are now on the market. The general opinion seems to be that the simple rigidly mounted gearing is fully as satisfactory for pump and blower service as the more complicated and costly floating pinion type, the only advantage of the latter being a better distribution of tooth pressures and possibly less noise. The development of condensers has not kept pace with that of the prime movers, and the committee in its report gave three appendices by prominent manufacturers on this subject. In addition, the committee itself made an elaborate investigation of condenser tubes under salt-water conditions. It pointed out that local galvanic action and not electrolytic action of stray outside currents is the cause of condenser-tube deterioration. Tube troubles were classified in three groups—split or cracked tubes, caused by improper mill treatment; pitted tubes, a failure common to coarse-grained material, and dezincification, resulting in brittle tubes. While it is impossible to draw definite conclusions from the results of the many experiments and investigations under way, the committee states that it seems reasonable to conclude that users may protect themselves by requiring manufacturers to furnish (1) mechanically perfect tubes free from slivers and blisters, (2) tubes of uniform hardness, and (3) tubes of uniform grain size in cross-section.

According to the General Electric Company, the present trend in the design of Curtis turbines of 10,000 kw and over is in the direction of higher speeds and a greater number of stages. At present horizontal turbines of from 20,000 kw to 30,000 kw are under construction. Although it appears possible to build machines of somewhat greater output along the lines of existing designs, any great increase in size would necessitate lower speeds, which in turn involves difficulty in obtaining suitable material and in shipping the large parts. In the light of present knowledge, it appears undesirable to build turbine-driven generators for pressures higher than 13,200 volts. Extreme voltages invariably result in higher temperatures due to thicker insulation and to the heating effect of the static potential strains.

The Westinghouse Machine Company is building turbines ranging in maximum continuous rating from 15,000 kw to 25,000 kw. The machines are designed for expanding to high vacuum, the whole expansion being carried out within a single cylinder. An innovation has been made in the case of some important machines of 30,000-kw rating lately contracted for. In these machines the expansion is carried out in two separate turbine elements, the one being compounded with the other and each driving a separate generator, the regulating mechanism controlling the admission of steam to the high-pressure element only. During the year a number of geared units have been shipped, driving direct-current generators. The most notable of these are the gears installed at the Cleveland (Ohio) Electric Illuminating Company's plant. The turbines operate at 1800 r.p.m., and the generators which are 3750-kw, 275-volt machines operate at 180 r.p.m., the ratio of the reduction gears being ten to one.

### Electric Vehicles

The desirability of building up a large vehicle-charging load is generally admitted, but there is some difference of opinion as to the means central-station companies should adopt in fostering the business. The committee on electric vehicles, of which Mr. G. H. Jones, of the Commonwealth Edison Company of Chicago, was chairman, expressed the opinion that the purely technical phases of the business can be left in the hands of the Electric Vehicle Association of America and the American Institute of Electrical Engineers, while central-station companies should concern themselves with matters of general policy and in giving unbiased advice on many points likely to arise. Central stations can help to bring about the general use of electric vehicles by maintaining public garages, by using electric trucks themselves, by making special rates for energy, by maintaining experts to give operating instructions, by supplying forms for operating records, by helping to sell vehicles and by advertising. One class of work seems to devolve more particularly on the central station and that is the education of the public in regard to the proper use of the vehicles. By this is meant not merely boosting and advertising but supplying such data relating to the actual performance of electric vehicles as will convince the public of the economy of using them and such operating instructions as the owner of the electric vehicle should have. Reliable data are lacking, especially information of the energy consumption per mile or per ton-mile. Such data are also necessary for the protection of the central station, otherwise dissatisfaction results. Salesmen are not over-cautious as to claims, and the owner feels that the central-station company is overcharging him if the energy used per ton-mile is greater than what he was led to expect. The committee recommended that member companies undertake in a systematic way to collect data from a sufficient number of each type of electric vehicle for which they are furnishing energy so that they may have information which will be representative of the several types of vehicles being operated.

## Berlin Meeting of the I. E. C.

With delegates and representatives from twenty-two countries, the International Electrotechnical Commission opened its sessions in Berlin Germany, on Monday, Sept. 1, with certain committee work preliminary to the plenary meetings beginning on Wednesday. On Sept. 3 Colonel R. E. B. Crompton, the honorary secretary, called the delegates to order and announced that, because of the illness of Dr. E. A. Budde, Dr. E. Warburg, director of the Reichsanstalt, had consented to take the chair. The secretary felicitated the commission on the work that had been accomplished and on the significant fact that national committees had been formed in twenty-two countries with several others soon to come. He then introduced Dr. Lewald, representative of the imperial cabinet, who welcomed the commission in the name of the imperial and Prussian governments.

Dr. Warburg then took the chair and the formal meeting opened. Secretary Le Maistre read a report on the upbuilding of the commission and the nature of its deliberations and work, following which Dr. Warburg extended an invitation to the delegates to visit the Reichsanstalt, the oldest of the world's national laboratories.

Mr. Alexander Siemens then nominated as president of the working sessions Mr. C. O. Mailloux, who was elected by acclamation and accepted in a graceful speech. Colonel Crompton then moved to transmit through Dr. O. F. T. Lewald a telegram of congratuation to the Kaiser on the occasion of his jubilee year, and the proposition was unanimously indorsed. This ended the formalities of the opening and the morning session.

In the afternon when the commission got down to serious business, the first matter considered was the report on the international specification for copper, based on the work of the four national laboratories. All mooted points on this subject had happily been cleared up in committee and the report was unanimously accepted. It will be remembered that this report places the resistance of the meter length sq. cm area standard annealed copper at 1/58 ohm at 20 deg. C. The only point in the report which provided any discussion of moment was a proposal to fix a standard minimum conductivity for "commercial" copper, whatever that may be. As the figure proposed was too low for line copper and needlessly high for commutator and terminal copper, the suggestion was dropped out of sight rather promptly.

Dr. S. P. Thompson then presented the report of the committee on nomenclature, which was unanimously accepted as a whole. Dr. Zoelly brought up the report of the committee on prime movers, which in turn was accepted unanimously. In these committees work had progressed very harmoniously. The latter committee had confined its attention to the matters pertaining to water-powers already published in a bulletin, and several suggestions relating to steam matters were passed over for consideration at the next meeting of the special committees. Perhaps the most important matter brought up was the need of specifications for safety in pipe lines, and arrangements were made for the exchange of ideas and data to gather material for consideration at the next meeting.

The report of the rating committee, which was really due at this session, was held over to obtain agreement on disputed points if possible. A rather serious clash had come with respect to limits of heating, and in particular over the temperature of the ambient air to be taken as standard. The maximum temperatures to be allowed at the hottest spots created comparatively little trouble, and the allowances below these for the measured temperatures were also agreed upon after considerable discussion, the basis being taken at a maximum temperature of 100 deg. C. and a measured temperature of 90 deg. C. for ordinary cotton or fibrous material impregnated with insulating material. At 40 deg. for the ambient air this means 50 deg. rise of temperature, but several of the more northern nations, in particular the Germans and Scandinavians, were holding out for a lower temperature than 40 deg. in the beginning, a figure as low as 30 deg. being mentioned. This would mean a rise of 60 deg., which might be suitable enough for cold climates. Apparatus thus standardized in warmer climates would, unless re-rated, certainly reach a temperature above the maximum allowed. It was at this point that there was a deadlock in the discussions.

The committee on symbols had difficulties also. As everybody knows, the letters commonly used in different countries for the same things vary, and there was mutual and stubborn opposition to change; then too the proposal to call the unit in the past known as mho by the name of "siemens" aroused opposition, chiefly on the ground of needless change, and altogether the proceedings were reported as taking a somewhat lively turn. A reception and supper to the delegates by the most cordial German hosts softened the asperities of much discussion and wound up the day's proceedings cheerfully.

On Thursday morning, when the commission was brought into action by President Mailloux, the first questions raised were those that had been touched upon just before closing the previous afternoon regarding the information of the special committees and especially the representation upon them of countries not included in the committees at Turin. There had been several direct requests for representation, and while evidently all countries could not come in without making unwieldly committees, the justice of some additions was evident. An amicable adjustment was made by adding representatives of Russia and Austria to the rating committee, of Norway and Denmark to the committee on symbols, and of Sweden, Russia and Denmark to the committee on prime movers.

A prolonged discussion followed the reading of the rating report, Germany taking the lead in a demand for higher rating than would correspond to an ambient temperature of 40 deg. The German delegate explained very properly that a small machine, of say 5 kw, rated at 40 deg. could not well be changed to an odd rating for sale in Norway and consequently would have to be sold on a basis which would make it needlessly expensive. As he did not volunteer information as to what he would propose to do in selling the same machine on German rating in, for instance, Egypt, where on that rating it would go to extra high temperature, the argument seemed inconclusive. At the beginning of the afternoon session the report of the committee on symbols was accepted in its entirety. The most notable thing was the adoption of the "siemens" to replace the cast-off mho.

When the rating question came up again the American delegates, supported by the British and various others, stood squarely for 40 deg. as the ambient temperature, while the Germans, supported by the Scandinavians, held just as determinedly for 35 deg. at most. After a deadlock was quite certain the committee retired for another quarter hour of fruitless discussion and came back to report disagreement. Then followed a long period of debate and suggestions of compromise which got nowhere. Ultimately those parts of the report which did not deal with ambient temperature were accepted, and the bone of contention was referred back to the national committees for discussion and report within a year. Practically therefore the vital question of settling an international rating is postponed until the meeting two years hence in San Francisco.

The plenary meeting took place on Friday morning, with Mr. Alexander Siemens as presiding officer. The minutes of the presiding meetings were read and the reports there accepted were duly ratified. A telegram from the Kaiser through his private secretary conveyed his thanks and best wishes. Invitations were then the order of the day. The Spanish delegates invited the special committees to

meet next in Madrid. The invitation from the Panama-Pacific Exposition, already duly acknowledged, was formally accepted and Mr. Mailloux explained the work of organization begun for the International Electrical Congress. The Russian delegate extended a cordial invitation to meet in St. Petersburg in 1917, which was received with applause and placed in course for future action. The formation of the International Commission on Illumination received due announcement from Mr. Carter, and after some friendly words from the delegates from South America, now for the first time in conference, the second plenary session of the International Electrotechnical Commission came to an end. Mr. Maurice Le Blanc was elected president of the commission for the ensuing year.

The American delegation consisted of Messrs. C. O. Mailloux, Louis Bell, H. M. Hobart and A. E. Kennelly.

## Mr. Fish on Patents and Industrial Conditions

At the recent meeting of the American Bar Association held at Montreal, Canada, a notable paper was presented by Mr. F. P. Fish, of Boston, entitled "Letters Patent in Relation to Modern Industrial Conditions," which contained many features of interest to our readers.

Mr. Fish claimed that the present period in the industrial history of our country is a critical one. For more than 100 years industrial progress has been the nation's aim and ideal, but now public sentiment, which once regarded business capacity and foresight as the most admirable of all qualities, has undergone a change. The country's extraordinary industrial development is possibly not ideal in character nor in its relations to society, but the present state of opinion has been due in some measure to criticism which was lacking in appreciation of the difficulties and complexities of the situation. Prevailing business methods are the subject of attack, and numerous features of industrial organization which are most characteristic of modern conditions are regarded with suspicion. But whatever may be the views of those who are free from mental bias in respect to the propriety of a protective tariff, the regulation of corporations and the reform of business methods, whatever may be the popular feeling as to the distribution of wealth that arises from our present social and industrial institutions, the questions as to the value and importance of a patent system and the spirit in which it ought to be organized and administered should be regarded as entirely independent of all such considerations.

No one doubts that industrial prosperity is essential to the welfare of a community, and if it is clear that a liberal patent system is essential to industrial development, all must favor it, whatever side they may take in the acute controversies of the day. No form of reward so fits the achievement, is so productive of advantage to the community and is attended by so few disadvantages as the grant to an inventor of a monopoly of his invention for a limited time. While many other forms of reward have been suggested (such suggestions were made at the convention which adopted the national constitution), they have nowhere been adopted as part of the machinery of society. Everywhere some form of exclusive control for a limited time has been recognized as the best method.

The encouragement of patent protection does not alone stimulate the inventor to intellectual effort; it excites to strenuous effort a long line of intermediaries, capitalists, investors, business administrators, licensees and users who work with or under the patent and whose co-operation is vitally necessary that the invention may not be confined to a paper description but may actually get into use. The ultimate consumers get their advantage from the invention, even during the term of the patent, in lowered cost, added facilities, increased comfort and greater convenience.

This form of reward for invention is strictly automatic and comes only to those who meet a public need and give the community something it desires and will use. Practically every civilized nation in the world now has a patent system, although Switzerland had none until 1888, when, finding that there was no stimulus to invention or industrial progress, the lead of more progressive nations was followed. Holland in 1869 abolished her patent law, undoubtedly in the hope that domestic industry would be thus stimulated, but found the reverse to be true and more than a generation later re-established the patent system.

Nowhere can it be worth while to invent unless there is opportunity for utilizing inventions as made. An adequate patent system gives to the inventor, who as a rule never could himself do anything with his invention, something that is tangible and of value, which he can transfer, in whole or in part, to the business enterprises which alone can make the invention of value to the community. Inventors and business men who develop inventions and introduce them to the service of man, to exactly the same degree and for the same reason, are stimulated by the protection afforded by a patent to efforts which they would never otherwise make. Each class would be helpless without the other. It is only when both are encouraged and protected, as they are by the grant of a patent, that the progress of the useful arts is promoted. Even if the invention meets a real demand, there is frequently the opportunity and occasion for the expenditure of a vast amount of money and of the greatest intelligence and energy on the part of those who are introducing it into use before commercial success can be attained, and always there is the chance of utter failure.

Very few inventions are the result of a happy thought which comes without cost or expense and is complete and perfect at conception. Most of them spring first from a clear recognition of the given problem or opportunity, requiring exact knowledge and trained judgment, and then require the intellectual effort to find a solution. Next comes experimentation, attended so frequently by failure, and lastly realization of the goal after much patient expenditure of money and time.

If the industrial workers of a nation are discouraged from inventing, they are likely to stagnate—they lack the training and the right habits of mind. On the other hand, when stimulated to invent, there is developed also the capacity or instinct to make mechanical improvements not amounting to invention but of great value in the arts. Such improvements are by-products of the inventive habit.

The patent system of the United States, which has existed for nearly 125 years, has in the past been the subject of attack only once, in the late seventies. Congress at that time took no action. Now, again, it is the object of attack, in connection with the so-called Oldfield bill, although the attack is not supported by any public demand for a change in the fundamental law. There is, however, a widespread conviction that reforms are needed in the procedure of both the Patent Office and the courts.

The American patent system differs from the English system, which alone preceded it, and from most others in two important respects: First, a patent here is granted only to the first inventor himself, whereas in England the reward goes to him who first introduces the invention into the realm, whether he originated it himself or found it in some other country; second, the patentee and those with whom he elects to share his right in working his patent have absolute and exclusive control of the invention for the statutory period. The patentee may attach to a license any conditions, as laid down in the National Harrow case,* "not definitely illegal," except so far as the Sanatogen case† denies him the right to attach a condition to an article which has been sold for the full consideration which the patentee expects to receive.

* Bement versus National Harrow Company, 186 U. S., 70.
† Bauer versus O'Donnell, 229 U. S., 1.

It seems obvious that the standards and rules imposed by foreign patent laws as to working inventions and as to the grant of compulsory licenses are and must be purely arbitrary. No man who is inclined to invent or to promote invention can be sure that any particular invention will not be one of a class that is necessarily rendered unprofitable because the law fails to give him a free field for effort during the term of the patent.

The simple provision of the United States patent law that after the grant of his patent the patent owner shall control the invention absolutely for a short but definite term, having no more payments to make and no fear of interference from competitors during the term, gives to our people a far greater stimulus to invention than does the law of any other country.

To-day there are not only a very large number of men struggling with inventive problems or who are on the lookout for the opportunity to invent, but the effort has been systematized to a large extent in accordance with the scientific principles upon which modern business is carried on. With the large enterprises of the country, invention is as much a part of the systematic organization of the business as manufacturing or selling. Highly trained engineers and inventors attack industrial problems as they are presented and work them out in well-equipped laboratories, where not only technical skill but thorough scientific investigation, carried on almost regardless of expense, is applied to their solution. Meantime, individuals are inventing or hoping to invent. They know that nothing is more likely to advance them in wealth and comfort than an invention, the opportunity for which is wide open before them, reward in proportion to the merit of what they may accomplish being almost more certain than in any other field of human endeavor.

The growth and importance of our patent system is indicated by the following statistics. There were filed in the Patent Office 41,980 applications in 1900, 54,971 in 1905, 64,629 in 1910, and 70,976 in 1912. The number of patents issued was 993 in 1850, 4778 in 1860, 13,947 in 1880, 26,499 in 1900, and 35,930 in 1910. The number of patents issued in the principal countries of the world is given in the accompanying table.

PATENTS ISSUED IN LEADING COUNTRIES OF THE WORLD

| | To 1870 Inclusive | 1870 to 1911 | Total |
|---|---|---|---|
| United States | 120,573 | 1,002,478 | 1,123,051 |
| France | 103,934 | 336,964 | 440,898 |
| Great Britain | 53,408 | 371,966 | 425,374 |
| Germany | 9,996 | 238,110 | 248,106 |
| Belgium | 35,044 | 202,456 | 237,500 |
| Canada | 4,081 | 129,609 | 133,690 |
| Italy and Sardinia | 4,723 | 94,175 | 98,898 |
| Austria | None | 64,793 | 64,793 |
| Switzerland | None | 50,197 | 50,197 |
| Spain | None | 44,987 | 44,987 |
| Sweden | 1,629 | 31,734 | 33,363 |
| Russia | 1,464 | 23,528 | 24,992 |

It is clearly far more than a coincidence that the number of patents issued has so largely increased simultaneously with the most extraordinary development in manufactures the world has ever seen.

In 1850 the manufactures of every kind in the United States amounted to $1,019,106,616. In 1880 they had increased only to $5,369,579,191. In 1910 they had attained the enormous total of $20,672,051,870, an amount equal to one-fifth of all the wealth of the United States, six times the total money in circulation, nine times the total gold and silver in circulation, twelve times the total domestic exports, thirteen times the total imports, twenty times as much as what would be required to pay the national debt, and 216 times the value of all the gold produced in the United States.

Between 1905 and 1910 the number of establishments engaged in manufacture increased nearly 25 per cent, from 216,180 to 268,491. The number of employees increased nearly 24 per cent, from 5,981,939 to 7,405,313, and the wages of employees increased nearly 38 per cent. The amount of wages paid in manufacturing industries in the United States in 1910 amounted to nearly two-thirds of the total wealth of the United States in 1850, nearly one and a half times the total money in circulation in 1910, and nearly twice the amount of wages paid out in 1900.

Up to a recent time an enormous amount of free land was open to cultivation. This has now been practically exhausted, and that fact adversely affects our industrial situation. The prevailing popular sentiment of to-day and the new laws and new interpretations of old laws based upon that sentiment require a definite readjustment of business and of business methods in all their relations. The process of readjustment will surely be one of shock to our industries.

Foreign competition is sure to become more serious every year. In our competition with foreigners we are hampered in many ways. In our cost of production we are embarrassed by the high cost of our labor as compared with other countries. We have in the past more than held our own in international competition, chiefly because of our superiority as inventors and in the quick and comprehensive adoption of inventions. If the process of continuous improvement is checked, we shall lose this advantage and there will be no alternative except the destruction of some or many of our most important industries or a reduction in the wages and standard of living of our workmen.

There is no longer room for the striking advances in agricultural machinery, machinery for making fabrics and shoes, electrical and other power apparatus, machinery employed in the production and working of wood and metals and in other great departments of industry that there was a few years ago. Many of the arts are already developed almost to the point of saturation. It is not so easy as it was to find out how they can be improved and to improve them. There should be every possible incentive to seek out and to develop an incessant series of minor improvements which may in the aggregate afford great possibilities of advancement. The latter are of a kind that especially require encouragement, for they do not greatly appeal to the imagination and the direct returns from any one of them are not likely to be large. But agriculture and the production of food products may be revolutionized during the coming century by chemical inventions, and in other fields there is room for many great and important improvements, which cannot be realized unless our patent system affords the requisite encouragement.

The Oldfield bill, which has been reported by the committee on patents to the House of Representatives at Washington, is a most serious attack upon our patent system. It restricts the patent owner in the manufacture, use, sale and license of patented articles and under certain circumstances compels him to license the invention to any person or corporation that requests it. Such a requirement would check invention and the development of inventions, invade the established law of the land and be a national misfortune.

There is little occasion for the revision of our patent law so far as its fundamentals are concerned, but it is far otherwise with respect to procedure in the Patent Office and the courts. It is even doubtful whether the new rules of practice formulated by the Supreme Court will be satisfactory. There is also need for a single court of patent appeals, instead of the nine circuit courts of appeal now existent.

In closing, Mr. Fish stated that he had passed by many phases of the subject, such as the arguments against compulsory license, the charge that patents promote monopoly

to an offensive degree, and the proposition that patents are pigeonholed or suppressed. The sole purpose of the paper was to emphasize the controlling importance of a liberal patent system and express belief that our present law requires no fundamental changes.

## Colorado Convention of the A. E. S.

The twenty-fourth general meeting of the American Electrochemical Society, at Denver, Col., Sept. 9-11, 1913, was probably the most spirited and enjoyable gathering ever held by this society. Although the attendance from the Eastern States was somewhat small, the total number of delegates registered was 109, of whom 52 were from states outside of Colorado. The Eastern delegation arrived in Denver on two special cars, Monday, Sept. 8, and were received by a committee of representative Denver engineers and business men. A trip by automobile through the parks, over the extensive new boulevards and to Inspiration Point ended at the convention headquarters, Hotel Shirley.

### TUESDAY MORNING SESSION

In the opening paper of the Tuesday morning session, entitled "Some Aspects of Heat Flow," Dr. E. F. Northrup proposed that thermal-resistance values be stated numerically in their ratio to the thermal resistance of a selected standard. He suggested the adoption of two such standards, one for low-conductivity materials and the other for high-conductivity materials. Alundum cement, packed and baked under given conditions, was suggested as the first standard, and copper of 100 per cent electrical conductivity as the second standard. The author also described a number of methods for measuring thermal resistance suggested by electrical analogies.

In the absence of Prof. E. F. Northrup, this paper was read by Mr. C. A. Hansen. It was discussed by Messrs. J. W. Richards and C. W. Comstock.

In their paper, "The Flow of Heat Through Furnace Walls," Messrs. Irving Langmuir, E. Q. Adams and G. S. Meikle described mathematical methods of calculating heat flow through insulation of various forms and shapes, presenting both experimental and theoretical shape factors for various elementary surfaces, corners, edges, rods, etc. Examples of practical calculations were appended, giving results agreeing closely with experimental values.

This paper was also read by Mr. C. A. Hansen. The discussion which followed was enlivened by a communicated discussion from Prof. E. F. Northrup and remarks by Messrs. C. A. Hansen, J. W. Richards, F. A. Lidbury and C. W. Comstock.

In his paper, "The Heat Resistivity of Carbon and Graphite," Dr. J. W. Richards reported work done by Messrs. J. P. Stokes and A. D. Jamieson in the Lehigh University laboratory. These investigations give the heat resistivity in thermal ohms or degrees per watt, for National Carbon Company carbon (202 deg. to 853 deg. C.) as being 36.8 thermal ohms for a cm cube, and for Acheson graphite (240 deg. to 420 deg.) as 3.69 thermal ohms for a cm cube. Practically the same relative values were obtained at other temperatures, showing the heat resistivity ratio between carbon and graphite below 1000 deg. C. to be at least 10:1.

Mr. Richards' paper was discussed by Messrs. Carl Hering (communicated), F. A. Lidbury, C. A. Hansen, C. G. Fink and J. W. Richards.

From an elaborate study of the electrolysis of cyanide solutions Mr. E. F. Kern concluded that the progressive consumption of cyanide noted is the result of oxidation to oxy-cyanide compounds. Peroxidized lead and passive iron anodes were found to be more permanent than metallic anodes of either iron, nickel or lead, all of which pass into solution. Low-current density at both electrodes reduces the cyanide consumption, as does also increasing the alkalinity of the solution, the latter on account of decreasing the resistivity.

The paper prepared by Dr. E. F. Kern was read by Dr. E. P. Schoch. In the discussion which ensued the following men participated: Messrs. E. P. Schoch, G. H. Clevenger, J. W. Richards, F. A. Lidbury and F. C. Frary.

### WEDNESDAY MORNING SESSION

As has been arranged, the Wednesday morning session was held at the University of Colorado in Boulder. During a visit to the laboratories of the school the "Elderkin rectifier," essentially a commutator driven by a synchronous motor, was shown in Evans' electrical laboratory. Owing to the large amount of time consumed in visiting places of interest only two papers were read at this session. They follow in abstract.

From a series of experiments in the electrolysis of aqueous solutions of the simple alkaline cyanides, Messrs. G. H. Clevenger and M. L. Hall concluded that the bulk of the decomposition of cyanide is due to the oxygen liberated at the anode. Formation of calcium carbonate during electrolytic precipitation of gold and silver was explained by the production of alkali carbonate corresponding to the protective alkalinity employed. Investigators were warned against the use of electrolysis with an ore pulp, as this may result in the loss of a large amount of cyanide deposits, besides interfering with extraction by the formation of coatings of calcium carbonate on the ore particles.

A spirited discussion of this paper was indulged in by Messrs. F. A. Lidbury, G. H. Clevenger, F. C. Frary, J. W. Richards, E. P. Schoch and F. W Skirrow.

In a paper entitled "Possible Applications of Electric Furnaces to Western Metallurgy," Messrs. Dorsey A. Lyon and Robert M. Keeney declared that aside from the smelting of iron ores and the manufacture of aluminum and ferro-alloys, electric smelting is still in the experimental stage and will probably never replace existing processes where local conditions are favorable to the latter. In zinc smelting temperatures of 1500 deg. C. are required, so that the electric furnace offers the advantage of giving full temperatures just where needed. Under such conditions, therefore, electric furnaces may enable metallurgists to work out processes of greater efficiency more advantageously than is otherwise possible. The paper included detailed manufacturing data and tables of the cost of electrical energy from various sources and at the principal electrochemical manufacturing centers.

The paper elicited a lively discussion. Among those taking part were Messrs. F. A. J. Fitzgerald (communicated), D. A. Lyon, J. W. Richards, F. A. Lidbury, C. A. Hansen, G. H. Clevenger, J. A. Mathews, E. L. Crosby and L. B. Skinner.

### THURSDAY'S SESSIONS

"Progress in Electrostatic Ore Dressing" was the title of a paper by Mr. Frank S. Macgregor, who discussed the recent advances made by this method following the construction of the initial plant at Platteville, Wis. The energy required is small, a 3-hp plant being sufficient to operate from one to fifty separators. One attendant will care for a shift exclusive of handling ore. The electrostatic process has already been applied to separating zinc ores, silver, graphite, coal, etc. The paper was discussed briefly by Mr. G. E. Collins.

Mr. S. C. Lind in his paper, "The Transformation of Radiant into Chemical Energy," pointed out that much experimental evidence is now at hand showing electrochemical equivalence in gas reactions occurring under external ionizing agencies. The author suggested the use of the term "ionic-chemical equivalence" in discussing gas reactions and placed at 0.72 gram the theoretical maximum quantity of ozone produceable per hour by one gram of

radium. In the ensuing discussion the following were heard: Messrs. F. C. Frary, L. C. Lind and E. P. Schoch.

In his paper, "The Art of Electric Zinc Smelting," Mr. W. M. Johnson described early experiences with electro-metallurgical processes. Tables of data on recent electric furnace runs were also appended. From the progress at the Hartford (Conn.) plant during the past three years Mr. Johnson predicted that electric zinc-lead smelting will ultimately afford treatment costs as low as $6 per ton of ore, and that the losses, excluding roasting, will be reduced to: Zinc, 40 lb.; lead, 1 lb.; copper, 2 lb.; silver, 0.30 oz., and gold, 0.01 oz. per ton of ore. For the immediate future, however, he suggested multiplying this estimate by two.

Mr. Johnson's paper, which was read by Prof. J. W. Richards, elicited a long and animated discussion in which Messrs. J. W. Richards, Ericson, C. A. Hansen, F. S. McGregor, L. B. Skinner, G. H. Clevenger and J. L. Malm took part.

In his paper, "The Electric Zinc Furnace," Mr. Peter E. Peterson described the series of experimental furnaces built by him, recounting the difficulties overcome and the results obtained. He estimated that a ton of pay charge can be worked at a total cost of $12.67—of which $4.65 is chargeable to electrical energy (1401 kw-hr. at 0.332 cent per kw-hr.) and $1.33 for 9.5 lb. of electrodes at 14 cents per lb. The Rocky Mountain States, he declared, now present great opportunities for the electric-furnace treatment of complex zinc ores. Under its present condition the electric furnace should be a thorough success. With future experience costs will be greatly reduced.

In the short discussion following the presentation of Mr. Peterson's paper Messrs. G. H. Clevenger, L. B. Skinner, Ericson and Snow told of their experiences with the zinc furnace.

As the reading and discussion of these four interesting papers had occupied the greater part of the afternoon the papers which had not previously been read were presented by title and their joint discussion made as short as possible. A brief characterization of each of these papers is given below.

Mr. Arthur J. White's paper on "Simultaneous Determination of Copper and Lead, with the Rotating Anode" contained descriptions of methods of analysis of pure lead and copper, brass, foundry brass, zinc and cadmium, and bismuth and arsenic. The rotating-anode method was found also applicable to other alloys if containing less than 2 per cent of arsenic or bismuth, since the latter act as reducing agents.

In their paper, "Rapid Refining of Copper with a Rotating Cathode," Messrs. C. W. Bennett and C. O. Brown pointed out how current densities of 425 amp per square decimeter may be used in electrolytic deposition provided the cathode be rotated rapidly. Details of mechanical construction of a rotating-cathode cell were given and experiments were reported in which various copper solutions were used. Qualitative tests showed that only very accurate analyses of these deposits would show variation from 100 per cent copper.

"Effect of Light on Decomposition Voltage" was the subject of experiments reported by Mr. Alan Leighton in which he exposed one or both of the platinum electrodes of an electrolytic cell to the light from a mercury-vapor lamp. Illumination of the anode produced no appreciable effect, but illumination of the cathode increased the decomposition voltage. The light also tended to make both the solution and the deposited copper less stable, rendering it even possible to precipitate copper on shaded portions of the cathode but not on the illuminated portion.

Methods of obtaining "solid, thick deposits of lead from lead-acetate solutions" were discussed in detail by Mr. Frank C. Mathers, who insisted that any soluble lead salt will give a dense, coherent electrolytic deposit if the proper additional agents be used. A large number of varied agents were employed in the experiments, ranging through ammonium perchlorate and glue, acetic acid, peptone, extracts from feathers, casein, meat and vegetable extracts, tannin, fatty oils and gums. For electrolytes various strengths of lead nitrate, lead acetate, lead chloride and lead sulphate were employed.

Mr. R. M. Kenney presented a paper on electric smelting of chromium, tungsten, molybdenum and vanadium ores, in which were described practical methods of handling and preparing ferro-chrome, ferro-tungsten, ferro-molybdenum and ferro-vanadium. Theoretical considerations and chemical equations for the transformations were given, together with practical data of the commercial method in use, sources of ore, etc.

"The Carnotite Industry" was described by Mr. Siegfried Fisher. Carnotite is a source of uranium and other radio-active elements. While the process of treatment is essentially chemical, electrolytic refining can be advantageously employed in reducing the carnotite.

Mr. O. L. Kowalke reported observations on base-metal thermocouples in a paper in which he compared the nickel-chromium, nickel-iron, nickel-aluminum and iron-manganese couples now marketed by several manufacturers with standard platinum couples, over ranges of temperature between 300 deg. and 1100 deg. C. The author concluded that such base-metal couples give results well within the required accuracy of industrial high-temperature measurements. He recommended, however, that manufacturers exert more care in adopting thermocouples for customers' particular uses and that all such couples be thoroughly annealed before shipment.

"Osmium-Platinum—A New Alloy" was described in a preliminary paper by Mr. F. Zimmermann. These alloys, in various proportions, are intended to take the place of iridium-platinum, owing to the growing scarcity of iridium. Osmium-platinum is highly acid-resisting, and its electrical resistance is higher than that of an equivalent iridium-platinum alloy. It has great hardness and tensile strength and may be drawn into wires of the finest size.

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## Eastern New York Section, N. E. L. A.

The Eastern New York Section of the National Electric Light Association held its annual meeting at The Sagamore, Lake George, N. Y., Sept. 15. The attractive Adirondack region was scenically at its best for the convention, and when not engaged in the sessions the thirty delegates and guests found time to enjoy motor-boat trips, fishing, automobile rides, tennis, putting matches, hydro-aeroplane flights, speed-boat contests and the other diversions afforded.

Mr. Elmer J. West, vice-president of the Adirondack Electrical Power Company, Glens Falls, welcomed the convention to the lake region, recounting in a happy vein the history of the vicinity and comparing the work of the early pioneers with the industrial achievements of the electrical industry. After a brief response by Mr. A. T. Throop, Utica, N. Y., president of the association, the secretary, Mr. R. E. Russell, Schenectady, read his report and also that of the treasurer, Mr. F. W. McRea, of Glens Falls.

### Electric Vehicles in Central-Station Service

Interesting figures of the estimated savings effected by substituting electric vehicles for horse-drawn and gasoline wagons and trucks were next presented by Mr. C. S. Van Dyck, superintendent of the Schenectady Illuminating Company. In addition to its six or eight double and single-horse wagons, the Schenectady company formerly operated several gasoline trucks and motor-tricycles, using the last mentioned for setting meters. Without drivers, the daily cost of operating these vehicles was: Two-ton truck, $5.44; 1000-lb. truck, $3.71; one-horse wagon, $1.26; two-

horse line wagon, $2.71; three-wheeled motorcycle, $2.21.

Four electric trucks now largely replace this equipment and result in yearly savings ranging from 25 to 35 per cent of the investment in the electric machines. The new battery-driven vehicles have been in service since March and have given splendid satisfaction, declared Mr. Van Dyck.

### PUBLIC CONFIDENCE IN UTILITIES

"Public Service and Public Opinion" was the subject of the address by Mr. William McClellan, New York City, formerly engineer for the Public Service Commission of the Second District. Every business, declared the speaker, needs public support and the support of public opinion. Even monopolies experience a form of competition—the "competition of disuse"—owing to the fact that the public can "get along" without their services. In this sense, all rates are competitive since they must be low enough to attract business. Public confidence is a valuable asset, and one which, built up at great expense and effort, may be destroyed by a single untoward incident. Honest, straightforward business methods must invariably be employed by utility corporations, despite the difficulties manufactured by those who have personal ends to serve.

Many companies have been so earnestly engaged in the struggle of earning a bare existence that their managements are too preoccupied to be informed on the details of operation, rate-making, etc., and while this principle of expediency has been justified in the past, a different policy is necessitated by the future, said the speaker. The widespread introduction of commissions has changed the viewpoint of utility operation, revealing to corporations how it is to their own interests to know the value of the properties they operate, their running expenses, the provision of proper maintenance for best efficiency, and the accumulation of funds if possible.

Although commissions sometimes enter local situations with limited information of detailed conditions, they oftener find, declared Mr. McClellan, discouraging "messes of ignorance" on the part of the company officers concerning their own properties. Such managers are, of course, busy and struggling to pay expenses, and have no time for the fine points, but even in such cases Mr. McClellan recommended "house-cleanings" of all doubtful policies and conditions. After a commission has completed such a house-cleaning the company investigated is sometimes appalled at the conditions discovered and sometimes discouraged, but. added the speaker, it is always interested. And in few cases has commission regulation done injury to the corporation involved. When complaints were received at Albany, Mr. McClellan said he found a mutually satisfactory step toward adjustment to be that of first referring the complainants directly to some individual officer in the company concerned. In ninety-nine out of one hundred cases explanation was made and adjustment effected without commission intervention.

### THE MANAGER AND THE PUBLIC

Utility officials should be accessible to the public, urged the speaker. With a cleaned house and nothing to hide, the manager should be able to explain his rate schedules and to answer satisfactorily the customer's questions. Broad principles of policy should be fixed, and then the widest possible latitude should be given to employees to interpret these policies, without referring unimportant matters to headquarters. Proper use of the employee as a company outpost in the community is another principle little understood, declared Mr. McClellan. Scattered as they are throughout the population, such employees can be encouraged to answer questions honestly and frankly and to create for the company public opinion worth many dollars.

Constructive policies are needed, concluded the speaker, both in the administration of individual companies and in the conduct of associations of utility interests. Many successful companies, for example, have representatives attend all meetings of movements for the public welfare. Constructive suggestion in advance will often avoid embarrassing and destructive legislation.

A new alignment and rearrangement is now apparent in the relations of capital, public and operating man, said Mr. McClellan in closing. Heretofore capital has been the dominant factor, and to it the old-fashioned manager looked for orders. The new type of operator has the courage to face his directors and demand adequate service for the public. And only in such a three-stranded partnership, with the operating man representing the interests of both capital and public and seeing that each gets its rightful share, will all three parties receive their just deserts.

### LOSSES DUE TO VOLTAGE DROP IN WIRING

Continuing the subject of co-operation with the customer, Mr. J. G. Henninger, Cleveland, Ohio, told of the work done by the National Quality Division staff in investigating conditions of customers' lamp voltage, candlepower and illumination. In many cases excessive drops are found between service switch and socket. For a number of industrial plants this average drop was 2.9 volts, indicating a 10 per cent loss of light to the customer and a 4.6 per cent reduction in central-station revenue. For residences the average drop of 3 volts showed 10.8 per cent loss of light and 4.6 per cent reduction in energy sales; while for stores 1.5 per cent drop gave 5.5 per cent light loss and 2.3 per cent energy reduction.

On the country's $300,000,000 annual electric-lighting bill, the saving of this 3.8 per cent loss would amount to about $10,000,000 yearly, suggested Mr. Henninger. In conclusion, he showed that when lamps are being burned at their greatest efficiency, resulting in highest satisfaction and economy for the customer, the central station will be earning its maximum income and the manufacturer will do the greatest renewal business.

### MEDALS FOR RESUSCITATION HEROES

Dr. C. A. Lauffer, medical director Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., followed with a demonstration of the Schaefer method of resuscitation, which he declared to be five times more efficient in filling the lungs, than the more laborious Sylvester method. He urged a more general diffusion of resuscitation knowledge and declared that the moral law makes guilty of contributory manslaughter any bystander who neglects to attempt intelligent resuscitation of a person apparently dead from electric shock.

As a means of distributing resuscitation knowledge, Dr. Lauffer proposed the institution of an N. E. L. A. hero commission to award bronze medals to persons resuscitating victims of electric shock. Each such instance reported could be investigated thoroughly, and the information incidentally obtained would be of the greatest value in accident-prevention work. This medal suggestion received hearty sanction from the convention, and Messrs. A. A. Anderson, Albany; C. S. Van Dyck, Schenectady, and W. A. Buttrick, Glens Falls, were appointed a committee to urge the proposal before the national association.

### LIGHTING OF THE PANAMA EXPOSITION

At the evening session Mr. W. D'A. Ryan, illuminating engineer for the General Electric Company, Schenectady, N. Y., gave an illustrated talk on the illumination effects at the 1915 San Francisco Panama-Pacific International Exposition, for which he is director of illumination. Besides a number of lantern slides, Mr. Ryan exhibited banners and standards to be used for the concealed magnetite lighting of the building exteriors and displayed paintings of the effects when complete. He also showed a number of the cut-glass "Panama jewels," of which 125,000 will be used, weighing 10 tons and costing $60,000. Scintillator effects are to be em-

ployed at San Francisco on an unparalleled scale. Among the display features will be a huge steam locomotive painted in cream and gold and illuminated by projectors while steaming at 60 miles per hour on a rotating turntable. To gain the requisite semblance of power, the locomotive will be made to develop 1000 hp on water-brakes. During his address Mr. Ryan also discussed general illumination subjects, exhibiting various forms of arc lamps and illustrating the effects of proper illumination in lighting statuary and art objects.

Election of Officers

The report of the nominating committee, made up of Messrs. J. C. Hemmingway, Glens Falls, chairman; M. O. Troy, Schenectady; J. C. G. Bradley, Syracuse; W. J. Reagan, Utica; E. M. Ellsworth, Schenectady; L. Hagood, Schenectady, and P. F. Roohan, Saratoga Springs, was unanimously approved by the convention, and officers declared elected as follows: President, Mr. H. W. Peck, Schenectady; vice-president, Mr. Leon Scherck, Poughkeepsie; secretary, Mr. C. S. Van Dyck, Schenectady; treasurer, Mr. F. W. McRae, Glens Falls; executive committee, Messrs. A. A. Anderson, Albany; A. T. Throop, Utica; O. F. Webster, New York; H. G. Davis, Watertown; L. Hagood, Schenectady, and J. C. Hemmingway, Glens Falls.

## The Electric Vehicle at Boston

Seventy members and guests of the Electric Motor Car Club of Boston assembled at the Boston Edison company's office on Sept. 10 for the first fall meeting of the season, General Superintendent W. H. Atkins of the latter organization being host. At the close of the usual luncheon the membership was increased to a total of 124.

Mr. S. G. Thompson, Public Service Corporation, Newark, N. J., cited the development of electric-truck applications in his territory, which represents an increase of about 1000 per cent in the past two years. At present 304 electric trucks are in service on the company's lines, compared with thirty in 1911, when the electric-vehicle department was organized. There are 206 pleasure cars of the electric type in service. The total advertising expense in this campaign has been under $20,000. The company aims chiefly at electric-truck development on account of its income possibilities. The territory of the Public Service Corporation offers a market for a total of 4000 trucks, which it is estimated would yield a yearly revenue of $1,080,000 at a rate of 3 cents per kw-hr. It is anticipated that this development will be attained within the next fifteen years.

MASSACHUSETTS ELECTRIC VEHICLE REGISTRATION

| | 1912 | 1913 | Gain | Per Cent Gain |
|---|---|---|---|---|
| Pleasure cars | 443 | 562 | 119 | 26.8 |
| Commercial cars | 227 | 389 | 162 | 71.3 |
| Total | 670 | 951 | 281 | 41.9 |

President Baker announced that plans are being made for holding an electric-pleasure-car exhibition in the ball-room of the Copley-Plaza Hotel, Boston, early in November. An effort will be made to class this among the social events of the year in Boston Back Bay circles. It was announced that the Boston Edison company is prepared to extend to dealers in commercial electric cars the use of its Stanhope Street garage as an exhibit space supplementary to the pleasure-car exhibition.

Mr. Frank J. Stone, Boston, reviewed the results of an electric-vehicle advertising campaign in Philadelphia, where there had been an increase in the sale of pleasure cars amounting to 75 per cent in 1911-12, with a publicity expense of about $1,000 per dealer. The total number of cars sold in this period was 128, compared with 74 in the previous year. The advertising was concentrated in a single medium and was well organized in arrangement and scope. Mr. O. G. Draper, Boston, gave the accompanying data as to electric vehicle growth in Massachusetts to Sept. 6, 1913.

He stated that the present registration of electric vehicles in New England totals 1539, of which 970 are pleasure cars and 569 commercial machines.

Before the close of the meeting President Baker announced that the Massachusetts Highway Commission has gone on record in its latest annual report to the effect that horse-drawn vehicles with narrow tires are working far more damage to the roadways than motor trucks, whose broader tires and distributed weights are favorable to lower highway maintenance costs. The next meeting of the club will be on Sept. 24, and a meeting of the New England section of the Electric Vehicle Association of America will be held in Boston near the end of the month.

## Texas Jovians Celebrate at Galveston

Jovian Day was worthily celebrated by Texas Jovians on Sept. 6. Members of the Jovian Order from Houston and Galveston united in a parade, rejuvenation and joviation held at the latter city, entertaining also a number of visiting Jovians from Dallas and elsewhere. The parade was held in the early evening and was an elaborate and spectacular affair, fittingly examplifying the flourishing condition of the society in its native state. The initiation was held at the Crystal-Majestic Theater. Afterward there was a banquet at Harmony Club Hall, at which Mr. Fred M. Lege, Jr., was toastmaster. Many speeches were delivered. Mr. Max Levy, who arranged the details of the parade, came in for a share of applause, as did Messrs. A. K. Young, T. J. Jackson and others who were prominent in the arrangements.

## Power Development in National Forest

The Secretary of Agriculture has signed a water-power permit granting the right to use for power development certain land within the Lassen National Forest, Cal., to the Sierra Electric Power Company, Oakland, Cal. The water-power project is located on Mill Creek and approximately 25 miles east of the city of Red Bluff, in Tehama County. By means of low dams across the creek the flow is to be diverted into a conduit with a capacity of 300 cu. ft. per second and a total length of more than 16 miles. At the upper end of the pressure pipes a small regulating reservoir is to be built. In the power house—which is to be built of concrete—there will be installed machinery capable of providing a constant output of 22,500 kw. The energy will be transmittted at 110,000 volts.

## Illinois Commission Revises Overhead-Power-Line Crossing Rules

The Illinois Railroad & Warehouse Commission, as the result of fourteen petitions, five coming from the Aurora, Elgin & Chicago Railroad (electric) and nine from the Chicago, Milwaukee & St. Paul Railway (steam), to cross steam railroads overhead with high-tension transmission lines, has decided to revise its rules governing installation of overhead-wire crossings over the rights-of-way of railroad companies to conform to the specification adopted by the joint committee representing the National Electric Light Association and other societies. The Aurora, Elgin & Chicago Railroad, in filing its petitions, said that it had conformed to the specifications adopted by the joint com-

mitttee for overhead crossings of light and power lines and provided an overhead clearance of 30 ft. The rules of the Illinois Railroad & Warehouse Commission provide for an overhead clearance of 35 ft. On Sept. 4 the companies interested had a hearing, at the end of which the commission agreed to issue an order for each of the fourteen crossings if both the petitioners would conform to the joint specifications. Furthermore, the commission agreed that its own rules governing the installation of telegraph, telephone and power wires over the right-of-way of railroad companies needed revision. The engineers for the railroad commission will begin at once to revise these rules, using as a basis the specifications adopted by the joint committee.

## Wisconsin Commission Shows Milwaukee that Central-Station Energy Is Cheapest

An informal report on the cost of street lighting, submitted by the Railroad Commission of Wisconsin at the request of Alderman W. I. Greene, chairman of the City Council committee on street lighting, Milwaukee, shows that energy purchased from a privately owned company will cost $46,873 less per year than if generated by the city. This report means the end of the project of a municipally owned plant, which has been advocated by the Socialist party.

Expert advice was sought from the commission as the contract with The Milwaukee Electric Railway & Light Company expired three years ago and the Council ever since has been undecided as to whether the city should generate its own energy or purchase it. Since the city is prevented by injunction from generating energy except for its streets and public buildings, Alderman Greene considered that the load-factor would be poor, and solicited the advice of the commission.

At present the streets are illuminated by 2318 electric lamps, mostly old-style, 3120 gas lamps and 399 naphtha lamps. In one of the boulevard districts within a radius of 150 ft. the annual expense for lighting is $210, while only 200 ft. away the cost is $45 per year, showing the unequal distribution of lamps. It is partly for this reason that the committee on street lighting proposes to rehabilitate the system.

In a map showing the location of proposed lamps submitted to the commission for use in its investigation 3809 series magnetite lamps were shown. These were located at practically every street intersection, and where foliage is heavy it was specified that tungsten lamps should be used and spaced at more frequent intervals. About nine months elapsed before the commission was ready to present the final figures on Sept. 15.

The terms under which the estimate was made provide that all of the old electric street lamps shall be replaced; about sixty lamps will be installed in a ward which never had any lamps, and other wards will receive additional illumination. A portion of the lamps will be suspended over the center of the street intersection and some will be supported on brackets on poles. About 2525 will be supplied with energy from overhead circuits, and 1284 will be fed from underground circuits. It was estimated that the privately owned plant could furnish energy at an average rate of $62.25 per lamp per year, the rate per lamp per year on underground circuits being $76, against $55 for overhead circuits. At these rates it was estimated that the streets could be lighted at an annual cost of $230,000, or about $4,000 more than the cost at present for a less efficient system. By an exclusively electric street-lighting system the efficiency would be increased about 25 per cent over the present conditions.

A municipal lighting plant in Milwaukee would cost about $1,493,758, and the annual operating expense would be about $273,153, or a rate of $75.11 per lamp per year. The difference between this rate and the one offered by the privately owned plant may be accounted for by the diversity factor under which the latter operates. In place of installing one cable duct for the lighting system, the privately owned plant can use one of the ducts which it has already installed and charge the percentage of the whole duct system to the street-lighting account. Similarly with generating energy, the load-factor is higher than it would be in a municipal plant, which would operate only a portion of the day.

## Public Service Commission News

### MISSOURI COMMISSION

The Missouri Public Service Commission will call a conference some time in October of representatives of electrical, gas and water companies, to consider rules and standards for service. The Bureau of Standards will send a representative to attend the hearing.

### NEW JERSEY COMMISSION

Under the New Jersey public utility law, the Board of Public Utility Commissioners was authorized to adopt rules and regulations for the determination of the adequacy of service furnished by electric companies.

Tentative rules and regulations were prepared and were considered at a hearing held in the latter part of 1912. A number of matters were brought up which had a bearing on the rules, and subsequent inspection of some of the properties subject to the jurisdiction of the commission showed that material changes would have to be made before the rules should be promulgated. These involved the enlargement of the scope of the rules so as to include all utilities using overhead wires supported by poles.

The tentative rules and regulations have been issued in pamphlet form and will be considered at a hearing to be held by the commission at the State House, Trenton, at 11 o'clock in the morning of Oct. 8. The hearing is called on the question of the adoption of the rules and regulations as they now stand. The commission has requested those who are interested to be present at the hearing and to take such part in the discussion as they may desire. The commission desires to have as full and free discussion of the matter as is possible.

### CALIFORNIA COMMISSION

The Railroad Commission of California has denied the application of the Oro Electric Company for permission to furnish electricity in sections of Stockton and San Joaquin County in competition with the Western States Gas & Electric Company.

Upon the receipt of the application the commission decided to allow the Western States Gas & Electric Company ninety days for the installation of certain improvements and to grant the company exclusive rights in this territory if it complied with the conditions. At a hearing held by the commission the Western States company showed that it had complied with the directions of the commission, and the petition of the Oro Electric Company was therefore denied.

### NEW YORK COMMISSION

During August the New York Public Service Commission, First District, tested thirteen electric meters. All were found to be accurate within the requirements of the law.

### INDIANA COMMISSION

The Public Service Commission has been asked to approve a voluntary lowering of rates by the Merchants' Heat & Light Company and the People's Light & Heat Company of Indianapolis. The companies are controlled by the American Public Utilities Company and they were merged recently under the first order of the commission approving an electrical merger.

# Current News and Notes

Chicago Engineer a Benedict.—Mr. Thomas G. Grier, well known in Chicago electrical circles, was united in marriage to Miss Susie Ingeborg Clark on Sept. 16, 1913, in Boston, Mass. The wedding was one of unusual interest to the electrical industry, the bride being a sister of Mr. Augustus T. Clark, treasurer of the American Circular Loom Company of Boston.

* * *

Illinois Establishes New Coal-Producing Record.—Figures made public by the statistician of the United States Geological Survey show that the production of coal in Illinois in 1912 was 59,885,226 short tons, valued at the mines at $70,294,338. This constitutes a record for the State. Coal is mined in half of the 102 counties, the total coal-formation area of the State is 35,600 square miles.

* * *

Jovian Campaign Time-Limit Extended.—In view of the fact that many enthusiastic Jovians who are assisting the Society for Electrical Development in its membership campaign have reported that a large number of the men in the electrical business were still away on their vacations during the early part of September, the society has decided to extend the time limit in the campaign from Sept. 30 to Oct. 10.

* * *

Examination for Assistant in Laboratory Physics.—On Oct. 8 the United States Civil Service Commission will hold an open competitive examination for laboratory assistant in physics (male) for the Bureau of Standards, Washington, D. C. The salaries range from $900 to $1,200 per annum. Competitors will be examined in advanced general physics and electricity, and education, training and experience will count 50 per cent. Applicants must be between twenty and thirty-five years of age. Form 1312 of the Civil Service Commission gives further particulars.

* * *

New Form of Government for Springfield, Ohio.—The city of Springfield, Ohio (population, about 50,000), has adopted a new charter providing for the commission-form business-manager system of government. Five commissioners elected by the people are to elect a city manager, who will be the administrative head of the city and who need not be a resident at the time of his appointment. Franchises cannot be granted for a longer period than twenty years. The city reserves the right to purchase or lease all utilities. Dayton has adopted a similar charter and Akron has defeated the proposal.

* * *

Combined Mouth and Nose Telephone Transmitter.—For the purpose of transmitting the sounds emitted through the nose as well as the mouth Dr. Jules Glover has developed and patented in France a delicate microphonic transmitter for nose sounds to be used in combination with the standard form of telephone transmitter for mouth sounds. These two transmitters, each adjusted for its special service, vary the current in a common transmitting circuit acting upon a single standard receiver. It is claimed that speech is much more accurately and clearly reproduced by the new arrangement than by the old.

* * *

Electioneering in Chicago N. E. L. A. Section.—A lively campaign is in progress prior to the election of officers of the Commonwealth Edison Company Section of the National Electric Light Association. Two tickets are in the field. One, the "members'" ticket, is headed by Mr. F. J. Arnold, of the engineering department, who is candidate for president of the section; the other, the "popular" ticket, bears the name of Mr. W. C. Berry, of the claim department. Mr. Dana H. Howard, of the advertising department, is the candidate for vice-president on both tickets. The "members'" candidate for secretary is Mr. N. A. Rollins, of the engineering department, and the "popular" candidate for this position is Mr. T. J. Walsh, of the statistical department. Both sides have issued literature and are campaigning in vigorous fashion.

* * *

## SOCIETY MEETINGS

Detroit Industrial Engineering Society.—At the regular semi-monthly meeting of the Industrial Electrical Engineering Society of Detroit, Mich., held Sept. 12 at the Employers' Association Hall, Detroit, Mr. Albert Keith, chief electrician of the Pennsylvania Salt Manufacturing Company, spoke on the subject of "The Manufacture of Caustic Soda and Chlorine from Salt Brine by Electricity."

* * *

Meeting of the Electric Vehicle Association of America.—The regular monthly meeting of the Electric Vehicle Association of America will be held in the Edison Auditorium, 44 West Twenty-seventh Street, New York City, on Tuesday, Sept. 23. "The Value of Power Wagon Operation to the Community" is the title of the paper to be presented by Mr. F. J. Ryan, of *The Commercial Vehicle*.

* * *

Colorado Electric Club.—At the weekly luncheon of the Colorado Electric Club, held at the Albany Hotel, Denver, Sept. 11, Mr. F. B. Fulton, designer of electrical scenery for theatrical productions, addressed the club on the subject of "The Advancement of Electricity for Stage Purposes." At a recent meeting of the board of directors of the Colorado Electric Club it was decided to postpone the club's electric show until some future date.

* * *

Illinois Convention Next Week.—The Illinois State Electric Association will hold its annual convention at the Quincy Hotel, Quincy, Ill., on Sept. 24 and 25. Mr. J. J. Frey, of Hillsboro, is president of the association, and Messrs. H. E. Chubbuck and C. A. Willoughby, of Peoria, are secretary and assistant secretary respectively. Features of the Quincy convention will be a theater party on the night of Sept. 23 for all who arrive on early trains, a trip to the Keokuk water-power plant during the day on Sept. 24, and a smoker-cabaret at the Hotel Quincy on the night of the same day. The business sessions will be held on Sept. 25.

* * *

Rochester Employees' Benevolent Association.—The employees of the Rochester Railway & Light Company have formed an Employees' Benevolent Association whose membership is expected shortly to reach 1000 out of the 1500 employees of the company. Messrs. Victor T. Noonan, secretary of the general safety committee, and Patrick F. O'Neil, foreman, were among the originators of the movement, which has received enthusiastic approval of the company's officials. The employees' association will be administered by officers selected by the employees themselves. Small enrolment and assessment fees have been fixed, and it is expected that the company will later contribute a substantial reserve fund to the organization.

* * *

Officers of Purchasing Agents' Association.—At its annual meeting held on Sept. 11, at Cooperstown, N. Y., in connection with the Association of Edison Illuminating Companies, the Association of Edison Purchasing Agents elected the following officers: President, Mr. William R. Huntley, Buffalo (N. Y.) General Electric Company; first vice-president, Mr. James B. Eaton, Rochester (N. Y.) Railway & Light Company; second vice-president, Mr. John H. Hunt, Pacific Gas & Electric Company, San Francisco, Cal.; treasurer, Mr. Andrew Banks, Consolidated Gas, Electric Light & Power Company, Baltimore, Md., and secretary, Mr. H. Frederic Frasse, Edison Electric Illuminating Company of Brooklyn, N. Y.

# Electrical Equipment of a Department Store

**Lighting and motor service installed in the Filene establishment, Boston—Indirect illumination and special display lighting derived from concealed units**

AMONG the recent additions to the shopping facilities of Boston, the new building of the Filene store, at the intersection of Washington and Summer Streets, in the heart of the retail trade district, is a structure of commanding interest from all the standpoints of architectural design, efficient merchandising and modern equipment. Completed but recently at a total cost, exclusive of land, of $2,225,000, this store illustrates the latest electrical applications in lighting, power and signaling service upon a comprehensive scale adapted to insure the greatest convenience in the sale of wearing apparel and accessories.

The building has a ground area 223 ft. long by 149 ft. wide and rising 125 ft. above the sidewalk in accordance with the Boston building limitations. It rises to eight stories above the foundations, the latter having been excavated to a depth of 53 ft. to provide three additional stories which are also in regular use. Mezzanine floors are provided on the first six stories above the street, affording space for department offices, quarters for 2500 employees and various auxiliary uses. The entire covering of the structural frame is of terra-cotta above the first story, and the building is of fireproof construction throughout. The architects were Messrs. D. H. Burnham & Company, Chicago, the electrical installation being made by Mr. Harry Alexander, electrical and contracting engineer, New York.

### Sub-Basement Power Plant

The electrical service of the building is supplied from a power plant located in the sub-basement. The boiler installation here consists of two 250-hp and two 500-hp Edge Moor horizontal water-tube boilers equipped with Roney mechanical stokers. These stokers are supplied with bituminous coal by a 16-in. motor-driven belt conveyor fed from a cross-conveyor, also motor-driven, which runs under five hoppers at the bottom of a reinforced-concrete coal pocket holding 200 tons. Coal is received by gravity from teams discharging at the sidewalk level. Ashes are taken from the furnaces by the fire-room force and dumped into a pit at one end of the boiler room, whence they are hoisted to the street for carting away. The hoist is of the motor-driven bucket type with a capacity of 15 tons per hour. The plant steam pressure is 150 lb. per sq. in. The boiler room, which also contains two electrically driven vacuum pumps used in connection with the steam-heating system, is 80 ft. by 46 ft. in dimensions, its floor being about 14 ft. below the level of the engine room.

The engine room, measuring 100 ft. by 60 ft., contains five direct-connected engine-driven generating units, each consisting of a horizontal single-cylinder Ball engine and a Crocker-Wheeler three-wire, 125/250-volt direct-current generator. Four of the units are rated at 300 kw each, the fifth being a 150-kw machine. The larger engines have 20-in. by 30-in. cylinders, and the small engine measures 16 in. by 20 in., the speeds being 150 and 200 r.p.m. respectively. The total electric generating capacity is 1350 kw, and the approximate total connected load is 1155 kw. Of this the connected lighting load represents about 475 kw and the connected

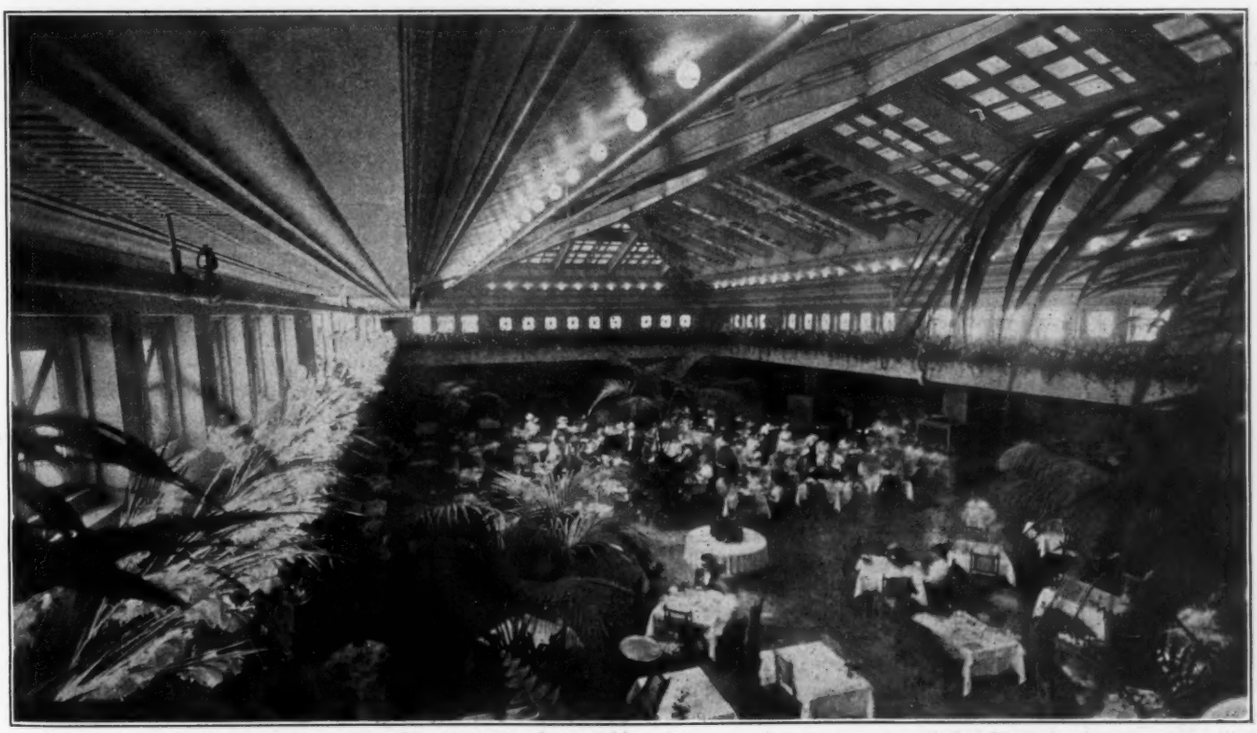

FIG. 1—ILLUMINATION OF RESTAURANT BY DIRECT UNITS INCLOSED IN FROSTED GLOBES

motor load 680 kw. Various heating devices of small demand are included on the lighting circuits. The ventilation of the mechanical plant is cared for by motor-driven fans connected with a duct system which permits frequent changes of air through suitable inlets and outlets.

### Switchboard and Electrical Distribution

The main switchboard, 26.5 ft. long, contains eleven marble panels shown in the accompanying illustration and

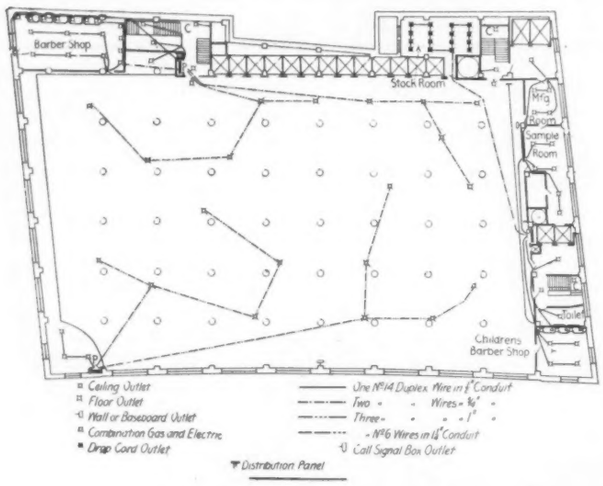


FIG. 2—DISTRIBUTION LAYOUT OF SECOND FLOOR

is located opposite the generators at a distance of 6 ft. from the engine-room wall, its ends being inclosed by an open grille protecting the rear of the panels. There are five generator panels, each containing a voltmeter, an ammeter, a field rheostat, a pilot light, a circuit-breaker with equalizer contact, and main and balancing coil double-throw switches. At one end of the board are two lighting switch panels. An intermediate totalizing panel adjoins the generator section, with two watt-hour meters for recording the lighting output. Eleven triple-pole, single-throw lighting feeder switches are installed, the risers being carried upward from the rear of the board through three-wire shafts together with the power feeders. All are in iron conduit and terminate in cut-out cabinets on the various floors as shown in the accompanying reproduction of the feeder sheet.

At the right of the generator section is a totalizing panel

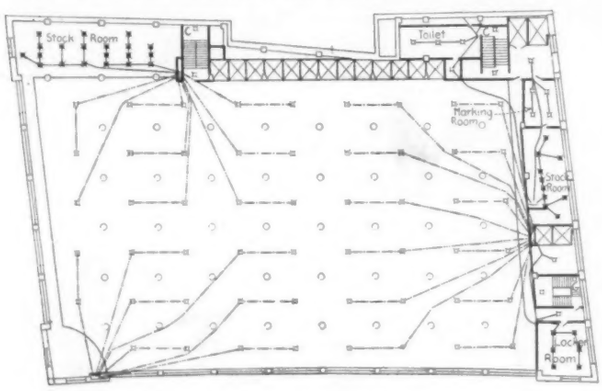


FIG. 3—DISTRIBUTION LAYOUT FOR SALES FLOOR

carrying a watt-hour meter for the motor record and two tie switches for bus service, there being one set of buses for motor service and one set for lighting. Two motor feeder panels are located beyond this totalizing panel, carrying fifteen double-pole single-throw switches controlling a corresponding number of motor-supply circuits. At the top of the switchboard is a ⅛-in. sheet-steel plate to which the conduits are fastened by lock nuts and bushings, the cables being carried from the conduit outlets to the switch terminals.

### Installation of Indirect Lighting

The lighting installation was planned with unusual care and is among the most noteworthy examples of indirect illumination lately placed in service. All of the main sales floors, with the exception of the basement, are equipped with indirect reflectors supplied by the National X-Ray Reflector Company, of Chicago. These reflectors are made of one-piece glass with vertical and spiral corrugations, plated with pure silver and protected by means of an elastic enamel.

On the first floor are fifty-three bays, each 20 ft. by 22 ft. in dimensions, the ceiling being 20 ft. high. Each bay is equipped with one reflector, containing six 150-watt clear-bulb tungsten lamps, giving an energy ratio of about 2 watts per sq. ft. and an illumination of about 5.25 ft.-candles on the working plane at the counter level. The distance from the top of the reflector to the ceiling is 60 in. The interior of each reflector is fire-glazed, which facilitates cleaning and tends to insure permanence of the illumination standard. In general, the interior finish throughout the building is light in color, the usual showcase and counter material being mahogany, except on the second and third floors where the cases are light gray in tint.

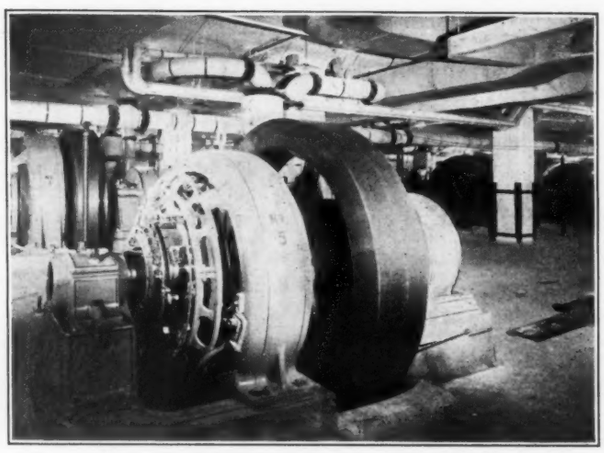

FIG. 4—VIEW IN ENGINE ROOM OF SUB-BASEMENT PLANT

On the first floor are departments displaying men's hats and furnishings, women's gloves, hosiery, neckwear, jewelry, leather goods and toilet articles, and, as described hereafter, special illumination is required in addition to the general indirect lighting in certain cases. The second floor, upon which are carried clothing for men and boys, boys' furnishings and shoes, has a 14-ft. ceiling, and the spacing and equipment of the indirect-lighting units is similar to that on the first floor, except that the distance from the top of the reflector to the ceiling is 42 in.

The third to sixth floors, inclusive, carry underwear, garments and feminine furnishings of varied character. These have 14-ft. ceilings and fifty-three 20-ft. by 22-ft. bays per floor, with one outlet per bay. From each outlet an indirect lighting reflector depends, each reflector containing six 100-watt clear-bulb tungsten lamps, the energy requirements being 1.36 watt per sq. ft. and the illumination at the working plane or counter level 3.5 ft.-candles. On these floors the distance from the top of the reflector to the ceiling is but 36 in. The seventh and eighth floors are occupied by general offices, fitting and alteration rooms, the latter floor including a large restaurant for the use of patrons and accommodations for feeding employees upon a co-operative basis.

### SPECIAL COUNTER LIGHTING

The standard method of illuminating counter interiors is by metal reflecting troughs at the top and front of each counter immediately under the plate-glass surface, all lamps being concealed from the eye. The typical counter has a cross-sectional display space 24 in. high and 19 in. deep. Each reflector is equipped with 25-watt tubular tungsten lamps installed 24 in. apart on centers, the reflector being supported at intervals of about 6 ft. by metal clips attached to the glass. This arrangement is followed regardless of the length of the case. Energy is supplied to the lamps in the counters by wires carried up from the floor at the corners in a ⅜-in. metal conduit run inside the counter. This conduit ends at the top of the counter, the leads being thence run horizontally to the lamp terminals inside the reflector. The lighting of each group of three counters on the main floor is controlled by snap switches located in a hinged metal box installed flush with the lowest stock shelf built around the columns.

On the first floor, in the jewelry department, additional lighting is provided to improve the display of polished goods by shaded pairs of tubular 25-watt lamps carried in dull-finished metal reflectors at a height of 5 ft. 6 in. above the top of the counter on brackets spaced 6 ft. 6 in. apart horizontally. Other examples of special lighting are found under certain balconies. where the effect of the main indirect

FIG. 5—TYPICAL SHOW WINDOW LIGHTING

illumination is reduced. In a typical collar display case 7½ ft. long, 6 ft. 4 in. high and 15 in. deep, placed near an escalator under a first-floor balcony, the lighting is provided by five 25-watt tubular lamps spaced 18 in. apart on centers and located in front of a metal reflector of the counter type. This case has a capacity of seven stands, holding 156 collars, and, at the ends, shelves holding thirty boxes of these goods. Little reliance is placed upon external lighting in connection with this typical case, the interior illumination being adequate for the exhibition of the merchandise contained within. In the hat department, under the first-floor balcony, four-lamp fixtures are used, containing 25-watt exposed lamps.

On the first-floor balcony there is a manicuring department containing a number of 18-in. by 30-in. porcelain-topped tables each equipped with a portable fixture connected by flexible cord with a wall outlet. Each fixture carries a 25-watt frosted-tip tungsten lamp shielded by a parabolic metal reflector, silver-lined and carried about 9 in. above the table. Similar lighting is provided for the manicuring tables of the main barber shop of the establishment.

On the second floor is a children's barber shop, 22 ft. by 20 ft., the general illumination being provided by four 60-watt lamps with diffusing shades installed in the ceiling at a height of 7 ft. above the floor. Three barber chairs are provided, and in front of these are plate-glass mirrors carried along the entire length of the wall and extending around the room, the walls being finished in white-enameled tile and with tiled floor and white ceiling and beams. Four 25-watt tungsten lamps are installed in front of the chairs to furnish additional special lighting at these points. The

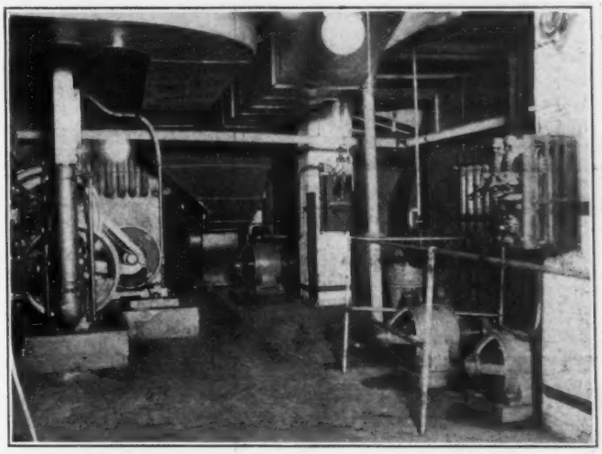

FIG. 6—MOTOR-DRIVEN PUMPS IN BASEMENT

main barber shop, 22 ft. by 43 ft., contains nine chairs, and its general illumination is provided by six 150-watt lamps equipped with prismatic reflectors and carried at a height of 7 ft. above the floor in two rows 10 ft. apart and 15 ft. on centers. Over each of the eight washstands is a 40-watt, frosted-tip lamp supplied with a translucent shade.

The standard showcase is 12 ft. long, 6 ft. high and 3 ft. wide and is illuminated by eight 25-watt tubular tungsten lamps installed 18 in. apart on centers in Frink reflectors. In stepping from the passenger elevators into the main aisle of a typical upper floor where cases of this size are installed this method of lighting at once attracts attention to the contents of the case.

### DIRECT ILLUMINATION IN RESTAURANT

The Filene restaurant, on the eighth floor, has a capacity

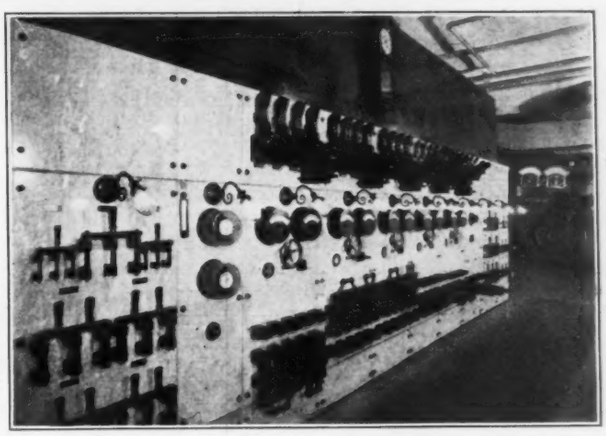

FIG. 7—SWITCHBOARD FOR FILENE BUILDING

of about 600 guests and is the climax of the interior decorative scheme of the building. The restaurant is L-shaped, the main portion, 50 ft. by 90 ft., being located under an ornamental monitor roof, as shown in the accompanying photograph. The remainder occupies a rectangular area under the roof on the Summer Street side of the building. In the case of the restaurant, the architects depended to a

large extent upon natural lighting for the main portion, which is provided with supplementary electric lighting around the under side of the monitor. Ninety 50-watt lamps are installed in translucent spherical globes for this service. The remainder of the restaurant is divided into 19-ft. by 22-ft. bays equipped with direct lighting, four semi-hemispherical Holophane reflectors being provided per bay,

FIG. 8—INDIRECT LIGHTING AND SHOWCASE ILLUMINATION

with two 60-watt lamps per reflector. The ceiling is about 12 ft. high in the case of these bays. Outside the main portion of the restaurant, at the elevator entrance, is an aisle 90 ft. long and about 18 ft. wide, which is illuminated by sixteen similar units installed in two rows parallel to the elevator doors. A waiting space is included in this area, with easy chairs and a magazine table carrying an ornamental alabaster lighting standard whose concealed incandescent units provide a soft and pleasing illumination for readers.

The clinic, which is located on the eighth floor in a corner of the building, consists of a physician's room, men's ward, women's ward and nurses' quarters. Indirect lighting is used in all these, with supplementary direct lighting for closets and other purposes. A view is shown of the physician's room, which is finished in white, and is about 7 ft. by 13 ft. by 12 ft. in dimensions. The general illumination is provided by one 150-watt lamp carried in an X-ray reflector, the bottom of the latter being about 8 ft. above the floor.

Over the consultation table there is a 100-watt frosted-bulb lamp mounted on a swinging pantograph arm at a height of about 4.5 ft. above the floor, with an extra outlet in the corner over a set of platform scales. The women's room, which is L-shaped, 48 ft. by 23 ft. in over-all dimensions, is provided with four indirect fixtures, each containing one 150-watt lamp. The men's room, 20 ft. by 11 ft., with a small supplementary skylight, is provided with one 150-watt indirect unit, and the nurses' room, which has no skylight and is 10 ft. by 11 ft. in dimensions, has one similar fixture.

The stockrooms are in one corner of the building on mezzanine floors and are in general 22 ft. by 70 ft. in dimensions, the usual number of outlets being twenty in each case. According to local requirements, lamps of from 15-watt to 40-watt rating are used in the stockroom general illumination. On the seventh floor, adjoining the fitting room, is a waiting room, 17 ft. by 28 ft. by 12 ft., with easy chairs and a reading table. The lighting here is provided by two indirect fixtures carrying four 150-watt lamps in each case, the bottoms of the bowls being 7 ft. above the floor and hung 7 ft. from each wall on a longitudinal axis. In clothing departments a special arrangement of mirror lighting is used, the installation consisting of a 40-watt lamp 6 ft. 9 in. above the floor on a bracket extending outward from the column for a distance of 15 in., to facilitate the use of folding mirrors which surround the column. The mirrors are 28 in. long by 5 ft. 4 in. high and are of plate glass.

### Systems of Signals

In front of each elevator door are two pilot lamps which indicate the travel of the car. At all exits two 15-watt lamps are installed in a transparency with a red glass suitably marked. Carbon lamps are being substituted for this service on account of their superior life record and on account of the importance of maintaining absolutely continuous operation at these points.

On each selling floor from the basement to the sixth floor inclusive are located two illuminated call-signal boxes, each containing nine signal lamps, numbered from 1 to 9, to summon heads of departments to headquarters when telephone or other business arises. These signal boxes are wired in tiers one above the other in two sets. The numbers are connected in series-parallel on nine circuits for each box, connected back to two banks of wall switches each in the telephone switchboard room of the house and wired back to a suitable cut-out cabinet. Each number is illuminated by a 15-watt lamp with a reflector.

At various points in the store public telephone pay stations are located, the standard booth being 2 ft. 10 in. by 7 ft. in dimensions, finished in light wood and lighted by one 25-watt frosted-tip lamp. Federal tubular sign lamps are used at various points to guide patrons to the different departments and selling sections. The lighting of the basement, which is broken up into a large number of selling

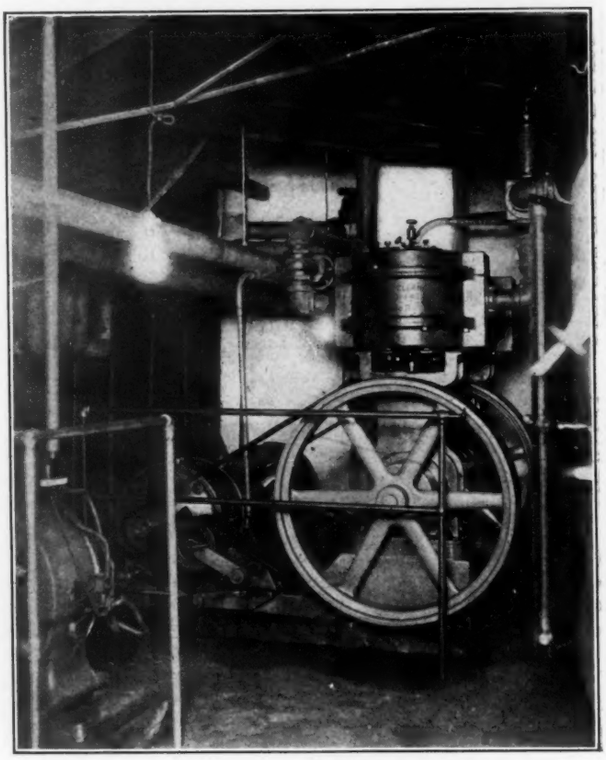

FIG. 9—MOTOR-DRIVEN VACUUM CLEANING MACHINE

spaces separated by glass partitions, is handled mainly by 100-watt open-bulb lamps with reflectors installed in the ceiling, this illumination also serving the basement balcony.

### Arrangement of Show-Window Reflector Units

The show-window lighting on the outside of the store is handled by 40-watt and 60-watt lamps installed in one-piece

silvered-glass reflectors set in troughs in the upper portion of the window and shielded from the eye by their location. The lamps are spaced about 15 in. apart on centers, and a typical window illumination view is shown herewith. Show windows equipped with this style of lighting are also located in the Summer Street station of the Washington Street tunnel, from which entrances are had to the store through turnstiles. The entrance lighting is cared for by the installation of two 40-watt lamps in 12-in. prismatic bowls 7 ft. above the floor of each vestibule. On three sides of the building a marquise is run above entrances and is provided with border lamps of 15-watt rating, spaced 16 in. apart, bulls'-eyes being installed in the front of the marquise, at the ends and in intermediate positions. Two 25-watt lamps are used in each of the latter. Around three sides of the building at the eighth floor a strip of 15-watt border lamps is also installed, 12 in. apart on centers. A total of 667 outlets are installed in the marquise and border lighting.

### DISTRIBUTION, WIRING AND OUTLET

The accompanying table gives the lighting outlets on the various floors. The wiring arrangements of the second floor and the second-floor balcony, which are typical, are shown in the accompanying diagrams. In general, the feeds for floor, wall and ceiling outlets are provided by two-wire and three-wire circuits run in metal conduit from three panel boxes located at widely separated points in the building, the riser connections being made between the panel boxes and the wire shafts previously mentioned. As a rule, each pair of indirect-lighting units for ceiling suspension

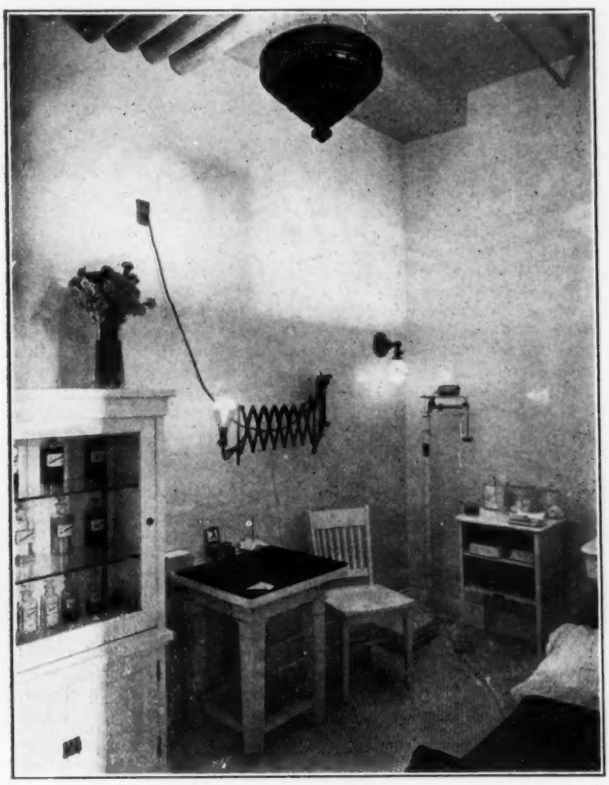

FIG. 10—LIGHTING IN SURGICAL CLINIC

is fed by a three-wire circuit running directly from the panel-box switch to the first unit of the pair, a two-wire extension being made for the second unit. In this way the lighting load is well balanced, each switch for such a circuit controlling service on each side of the three-wire neutral. No outlet is wired for less than 55 watts demand, and no more than 660 watts is allowed on any tap circuit except for exterior lamps. Fan outlets are wired for 110 watts capacity in each case.

Sizes of all lighting feeders are proportioned on the basis that all circuits provided in cut-out cabinets are loaded up to 85 per cent of the full capacity allowed by the insurance regulations, and the system is designed so that the drop of potential between the service and any cut-out cabinet will

FIG. 11—INDIRECT LIGHTING OF FIRST-FLOOR SALESROOM

not exceed 3 volts, measured across the outside legs of the three-wire system. The wiring is proportioned so that when loaded to its full capacity the drop of potential will not exceed 2 volts between any cut-out cabinet and the most distant outlet on any one circuit. A maximum drop of 1 volt is permitted on sub-feeders. Main lighting feeders pass through the rear wiring compartments of the cut-out cabinets which they supply, and they are supported on porcelain insulators on every floor where they pass through the wiring compartments.

All cables are anchored with strain insulators at their upper terminals and are supported by cable racks inclosed

LIGHTING OUTLETS IN FILENE STORE, BOSTON, MASS.

| Location | No. Outlets | WATTAGE OF LAMPS | | | | | | | Kw Connected |
|---|---|---|---|---|---|---|---|---|---|
| | | 150 | 100 | 60 | 50 | 40 | 25 | 15 | |
| Subway show windows | 160 | .. | .. | 160 | .. | .. | .. | .. | 9.6 |
| Basement balcony | 305 | .. | 233 | 2 | .. | 30 | 12 | 28 | 27 |
| Sub-basement | 233 | .. | 11 | 120 | .. | 5 | 57 | 40 | 12.35 |
| First floor show windows | 370 | .. | .. | 326 | .. | 47 | .. | .. | 21.26 |
| First floor | 1330 | 324 | 10 | 19 | .. | 112 | 815 | 50 | 80.3 |
| Second floor | 643 | 318 | 14 | 14 | .. | 42 | 174 | 81 | 57.2 |
| Third floor | 607 | .. | 321 | 17 | .. | 33 | 130 | 106 | 41.3 |
| Fourth floor | 853 | .. | 371 | 10 | .. | 45 | 322 | 105 | 51.2 |
| Fifth floor | 752 | .. | 361 | 6 | .. | 43 | 262 | 80 | 47 |
| Sixth floor | 814 | .. | 335 | 15 | .. | 76 | 297 | 91 | 49 |
| Seventh floor | 872 | 157 | 8 | 14 | .. | 152 | 175 | 266 | 40 |
| Eighth floor | 326 | 51 | 16 | 91 | 90 | 69 | 9 | 10 | 25.7 |
| Border and marquise | 667 | .. | .. | .. | .. | 241 | 17 | 409 | 16.2 |

in sheet-steel pull boxes at intervals of three or four floors. These cable racks are built up of heavy strap iron hung from an I-beam at the back of the slot in the floor, the cables being supported on porcelain cleats. A cut-out cabinet is provided in each shaft on every floor where the wire shaft opens. The cabinets are made of sheet steel with an interior slate box treated with linseed oil, the slate for the panel being 1 in. thick and for the side linings ¾ in. thick. Cut-outs are of the panelboard type, the connections being made through copper strips which are continuous from one

side of the circuit to the other. Each cabinet is provided with an even number of circuits. On the various selling floors are a number of twenty-five-lamp floor outlets for showcase lighting, and these are connected together by three-wire sub-feeders from the cut-out cabinets connecting a maximum of four to five outlets per sub-feeder.

### Electrically Operated Elevators

The mechanical plant of the store is modern in every detail and provides for heating, ventilation, elevator service, compressed-air supply, vacuum cleaning, pump service and numerous small power applications. Electric drive by individual motors is employed in all departments except the laundry. The elevators include eighteeen Otis electric machines and two hydraulic lifts, the latter serving only the lower portion of the building. There are thirteen electric passenger elevators running between the basement and the eighth floor, each having a live-load capacity of 3000 lb. at a speed of 300 ft. per minute; one passenger elevator and one freight elevator of the same speed and capacity running from the sub-basement to the eighth floor; one freight elevator running from the sub-basement to the eighth floor,

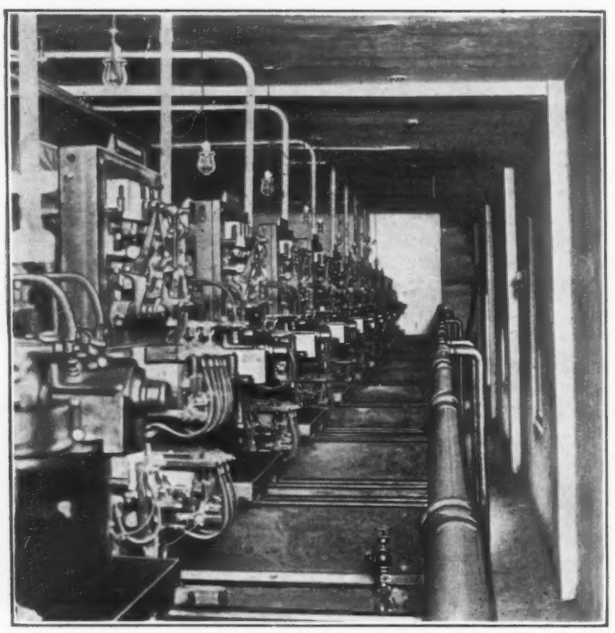

FIG. 12—MOTORS AND CONTROL EQUIPMENT FOR ELEVATORS

and one from the sub-basement to the seventh floor, with a capacity of 4000 lb. at a speed of 250 ft. per minute.

The main battery of thirteen passenger elevators is located in a single row on the north side of the building, the machines being carried on four 12-in. by 3-in. by 5/16-in. channel irons in each case. The channels are bolted together in pairs, being mounted upon channels inbedded in a concrete flooring or deck carried 42 in. above the roof. The battery is 100 ft. long and is illustrated in the accompanying photograph. All the elevator machinery is readily accessible by iron ladders from a passageway running parallel to the deck, and the controllers for each machine are located on slate panels adjacent to the corresponding machines. Water pressure for the operation of the two hydraulic lifts is supplied by a 7-in. by 8-in. Deane vertical triplex single-acting pump driven through a silent chain with a five to one reduction by a 17.5-hp motor. The capacity of this pump is 100 gal. per minute against 150 lb. pressure. The passenger elevator motors are rated at 34 hp each and those of the freight elevators at 40 hp. The Otis double-file cleat-type escalator in service between the first and second floors is designed to deliver 3600 passengers per hour ascending or descending. This escalator is chain-driven at the head end by a 17.5-hp motor. Between the sub-basement and the first-story balcony an automatic tray-type hoist for handling 24-in. by 43-in. by 33-in. baskets is in service, the apparatus being gear-driven by a 7.5-hp motor. The speed of this hoist is 60 ft. per minute.

### Dumbwaiters and Conveyors

Two automatic electric push-button dumbwaiters operate between the seventh floor, basement and second floor, each being driven by a 1-hp motor. The cars are equipped with electric lights which can be seen from the outside through a bull's-eye in the inclosure door, indicating when the car is at a landing. Locking devices are provided so that the car

LIST OF MOTORS IN FILENE STORE, BOSTON, MASS.

One 27-hp—Supplies fan, mechanical plant, belt drive (34,675 c.f.m.), 210 r.p.m.
One 13-hp—Supplies fan, sub-basement, basement, basement balcony (18,750 c.f.m.), 270 r.p.m.
One 10-hp—Supplies fan for entrances, belt drive (12,000 c.f.m.), 398 r.p.m.
One 30-hp—Supplies fan, sub-basement, basement, basement balcony (32,550 c.f.m.), 252 r.p.m.
Two 7.5-hp—Air compressors, 6-in. by 6-in., 60-lb. pressure chain drive.
One 3-hp—Air compressor, sprinkler dry-pipe system, geared, single-cylinder.
One 5-hp—Sump pump, air-washer overflow, vertical, direct-connected; capacity, 150 gal. per minute against 20-ft. head.
Two 2-hp—Air-washer pumps, 2-in. rotary, direct-connected.
One 5-hp—Air-washer pump, 3-in. rotary, direct-connected.
One 3-hp—Air-washer pump, 2.5-in. rotary, direct-connected.
One 15-hp—Deep-well pump, 2¼-in. by 24-in., well 585 ft. deep, capacity pump 90 gal. per minute.
Two 20-hp—Vacuum cleaning pumps, (six-sweeper), Sanitary Dust Removing Company, belted.
One 3-hp—Ash hoist, capacity 15 tons per hour, gear-driven.
Two 9-hp—Sewage ejectors, capacity of each 250 gal. per minute against 60-ft. head.
One 17.5-hp—Hydraulic pump, 7-in. by 9-in. Deane, vertical, triplex, chain drive, 5:1.
Two 0.5-hp—Vacuum pumps, steam-heating system, belted, capacity of each 6 c.f.m.
One 1-hp—Lamson pneumatic service system, capacity of exhauster 160 c.f.m., 480 r.p.m. (1-lb. vacuum).
Three 2-hp—Package conveyors, 75 ft. per minute, 24-36 in. (length 75 ft. on centers).
One 1-hp—Exhauster fan, shipping-room air duct (1,200 c.f.m.), 350 r.p.m.
One 10-hp—Laundry group drive, two washers, two extractors, 100-in. flat-work ironer, 36-in. body ironer.
One 1-hp—Apple parer and meat chopper, group drive.
One 0.3-hp—Polishing machine (Blakeslee), geared.
One 0.4-hp—Potato peeler (Victor), geared.
One 3-hp—Blakeslee ice cuber, Creasey ice breaker, group drive.
One 2.5-hp—Dish washer, capacity 6000 pieces per hour, three tanks.
One 2-hp—Dish washer, capacity 4000 pieces per hour, three tanks.
One 1-hp—Dish washer, capacity 3000 pieces per hour, two tanks.
Fifteen 34-hp—Capacity 3000 lb. live load, speed 300 ft. per minute, Otis elevators.
Two 40-hp—Capacity 4000 lb., speed 250 ft. per minute, Otis elevators.
One 17.7-hp—Escalator, up and down, capacity 3600 passengers per hour, each direction, rise 18.5 ft., speed 100 ft. per minute.
One 15-hp—Exhaust fan, sub-basement, etc. (33,500 c.f.m.), 200 r.p.m., direct drive.
One 19-hp—Exhaust fan, mechanical plant (33,700 c.f.m.), 215 r.p.m., direct drive.
One 4-hp—Exhaust fan, from toilets (8550 c.f.m), 295 r.p.m., direct drive.
One 15-hp—Exhaust, sub-basement, etc. (25,510 c.f.m.), 235 r.p.m., direct drive.
One 1.6-hp—Exhaust from kitchen (8000 c.f.m.), 450 r.p.m.
One 2.5-hp—Exhaust fan, kitchen off basement balcony (3000 c.f.m.), 350 r.p.m.
One 5.5-hp—Coal conveyor, 675 r.p.m. motor speed; 16 in. wide; length 14 ft. on centers, 16 degree incline, capacity 15 tons per hour.
One 2.5-hp—Cross coal conveyor, 16 in. wide, length 50 ft. on centers, capacity 15 tons per hour.
One 0.5-hp—Printing press, 11-in. by 17.5-in. jobber.
One 2-hp—Ice-cream freezer, capacity 10 gal., silent chain drive.
Two 0.16-hp—Carbonating machines.
Two 1-hp—Automatic dumbwaiters, capacity 150 lb. each, at 150 ft. per minute.
One 7.5-hp—Automatic hoist, geared, 60 ft. per minute, capacity 24 in. by 43 in. by 33 in. basket.
Twenty-four 0.14-hp—Sewing machines and auxiliary apparatus.

cannot be started if any landing door is open. The ash hoist between the boiler-room ash pit and the street has a capacity of 15 tons per hour and is gear-driven by a 3-hp motor.

A package conveyor installation is in service in the sub-basement to facilitate the classification of parcels for shipment. It consists of a system of canvas and rubber belts receiving packages from the floor above through chutes and carrying them past rows of bins assigned to various localities reached by the delivery service. Three motors of 2-hp rating each are required to drive this equipment, the belts ranging from 24 in. to 36 in. in width and running at a speed of 75 ft. per minute.

### Motor-Driven Fans and Pumps

Motor-driven supply fans are in service for furnishing fresh air to the mechanical plant, sub-basement, basement, basement balcony and the entrances, there being four fans for this work placed in an auxiliary machinery room adjoining the engine room. The capacities of these fans range from 12,000 cu. ft. to 34,675 cu. ft. per minute. All are belt-driven by individual motors varying from 10-hp to 30-hp in rating. The main selling floors are ventilated by natural inflow and outflow. An air-washer installation is provided for the sub-basement, basement balcony and basement, with a duplicate set of centrifugal pumps direct driven by motors, the pumps ranging from 2 in. to 3 in. in size, and the motors from 2 hp to 5 hp. Seven motor-

FIG. 13—MEN'S CLOTHING SHOP ON SECOND FLOOR

driven exhaust fans are in use in the establishment, five being on the roof, one in a small kitchen off the basement balcony, and one in a vent duct for the shipping department.

Motors with automatic starters are in use operating air compressors, a deep-well pump, sewage ejectors and an air-washer overflow pump. Two main compressors are installed, each of the Bury type, with 6-in. by 6-in. cylinders, driven by a 7.5-hp motor in each case and delivering air at 60 lb. pressure per sq. in. A sprinkler system with about 5000 International nozzle heads is installed, the sources of water supply being a triple connection with the city's high-pressure mains, three pressure tanks on the roof and four steamer-pipe connections. The show windows are equipped with a dry-pipe system, the air pressure on which is automatically maintained by a vertical single-cylinder compressor driven by a 3-hp motor. Two vacuum cleaning pumps are installed, each driven by a 20-hp belted motor.

### Miscellaneous Motor-Driven Equipment

The laundry contains two washing machines, two extractors, a 100-in. flatwork ironer and a 36-in. body ironer, group-driven by a 10-hp motor. In the alteration department are about two dozen sewing and auxiliary machines, each individually driven by a motor of about 0.15-hp rating, operated from the lighting feeders. Other electrical applications are small motors operating dish washers, a vegetable peeler, an apple parer, a meat chopper, a polisher, an ice cuber and an ice breaker in the culinary department, ice-cream freezers, two soda-water carbonators, a small printing press, two vacuum pumps on the steam-heating system, hair driers, electric heaters, vibrators, electric-bell service, an "Eco" watchman's clock system, thirty-six electric flat-irons, portable fans, Lamson pneumatic service, and a 500-mile Marconi radio station located on the roof. The latter

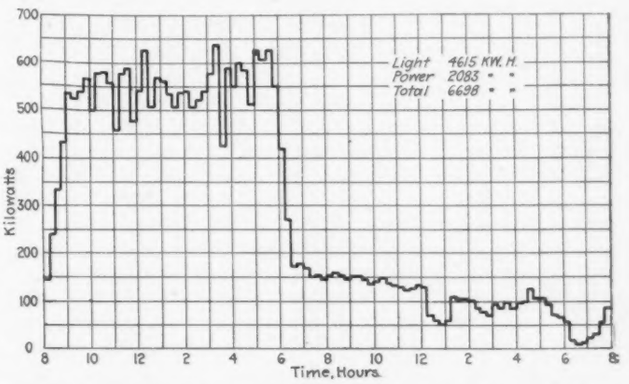


FIG. 14—HOURLY CONSUMPTION OF DEPARTMENT STORE

employs two 120-ft. steel towers, about 250 ft. apart, and a 5-kw motor-generator set. A continuous twenty-four-hour watch is kept in the station, and at intervals bulletins are posted on the first-floor balcony for the benefit of patrons.

The accompanying load curves are representative, Fig. 15 giving the output between 11.30 a. m. and 7 p. m. on Dec. 24, 1912, the day of the heaviest load carried by the plant, and Fig. 14 showing the variation in output from hour to hour for a complete twenty-four-hour run on Monday, Jan. 13, 1913. In the former case the maximum load was 720 kw, occurring at 5 p. m., the lighting output at the time being 480 kw and the power load 240 kw. The motor-service and lighting peaks did not quite overlap, although the readings were taken at the height of the Christmas shopping season. The peak load on Jan. 13 was about 640 kw.

Among those supplying motors for the Filene establishment were the General Electric Company, Diehl Manufacturing Company, Western Electric Company, Jenney Electric Manufacturing Company, and Sprague Electric Com-

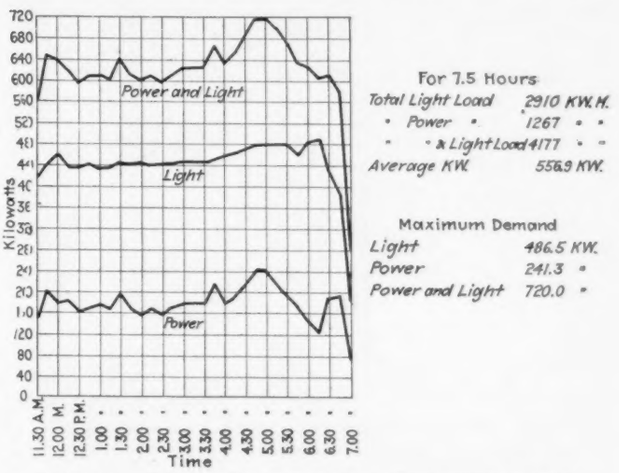


FIG. 15—DAILY LOAD CURVES OF FILENE STORE PLANT

pany; rheostats and motor starters, the Cutler-Hammer Manufacturing Company, the Cutter Company and the Condit Electrical Manufacturing Company; lighting fixtures, the Pettingell-Andrews Company; fans, the B. F. Sturtevant Company. Mr. David A. Chapman, betterment engineer, is mechanical and electrical superintendent of the installation.

# Graphic Solution for Illumination Problems

**Chart for rapid calculation of illumination density from known values of candle-power and of vertical and horizontal distances from the source. By Neville S. Dickinson**

MANY tables have been prepared to reduce the labor and shorten the time involved in the solution of illumination problems. This was the purpose that led to the construction of Illumination Charts 1 and 2, here shown. Fig. 3 illustrates a chart, reduced in size, suitable in scales for interior illuminants, and Fig. 1 shows a chart designed for exterior work. The problem of finding the illumination at any point from a lamp the light distribution curve of which is known, given the elevation of the lamp above the illuminated plane and its horizontal distance from the point in question, can be solved much more rapidly with the aid of these charts than with tables, and with an error not exceeding 5 per cent, and generally not more than 1 per cent, on charts 12 in. by 12 in. or thereabouts. The reverse problem—namely, of determining the various heights and distances at which a given illumination may be obtained—which ordinarily requires the drawing of several illumination curves, can be solved with similar ease.

As an example, suppose it is desired to find the horizontal illumination at *C*, Fig. 2, from a 100-watt tungsten lamp located at *E*, with its axis in a vertical position. Ordinarily, the problem would be solved as follows: After having found *AC*, the angle $x$ would be obtained from trigonometric tables or with a slide rule. From the distribution curve of the lamp (Fig. 4) the candle-power $P$ at the angular displacement $x$ would be scaled off. It is 122 cp in this case. $EC^2 = 5^2 + 10^2 + 8^2 = 189$. The horizontal illumination $\beta$ then is

$$\beta = \frac{P \cos x}{EC^2} = \frac{122 \times 0.58}{189} = 0.375 \text{ ft.-candle.}$$

On the first chart (Fig. 3) the horiontal characteristic curve, which will be explained shortly, is given in dotted lines, and the method of solving this same problem graphically is shown by the dotted arrowed lines. Thus, referring to Fig. 3, from the 5-ft. point on the "lateral distance from lamp" axis, move horizontally to the curve starting from 10 ft. on the scale of horizontal distances. From this point proceed vertically to the "height of lamp" curve marked "8 ft.," then travel in a horizontal direction to the dotted characteristic curve, then vertically downward to the 8-ft. "height of lamp" line, and finally leftward to the foot-candle scales. The answer in this case, scale *B*, is 0.38 ft.-candle, as nearly as one may judge, which, therefore, is an error of

$$\frac{0.38 - 0.375}{0.375}$$

or roughly 1.3 per cent.

Looking at the chart, it may be readily seen that had the reverse problem been stated—that is, of locating *C*, given the illumination of 0.375 ft.-candle—one could have done this by merely proceeding on the chart in the reverse order. The illumination of 0.375 ft.-candle, of course, may be

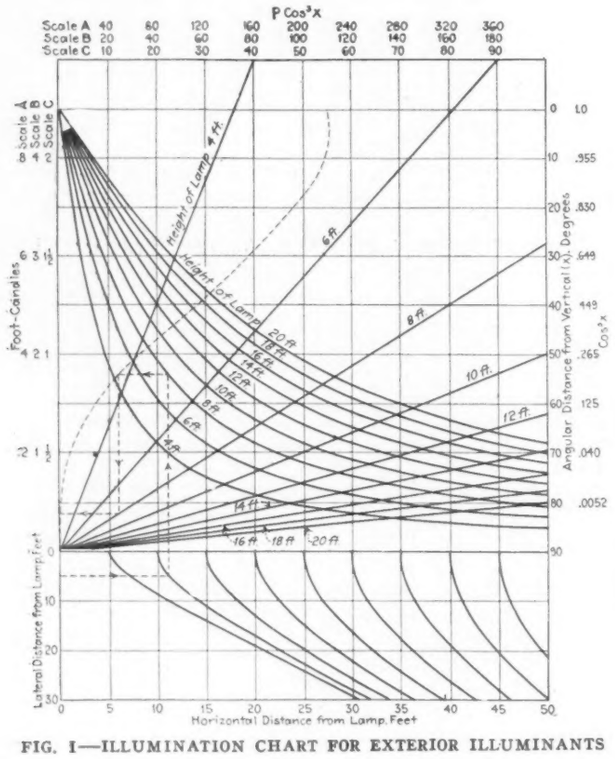
P Cos³x
Scale A 40 80 120 160 200 240 280 320 360
Scale B 20 40 60 80 100 120 140 160 180
Scale C 10 20 30 40 50 60 70 80 90
Foot-Candles
Angular Distance from Vertical (x), Degrees
Cos³x
Lateral Distance from Lamp, Feet
Horizontal Distance from Lamp, Feet
Height of Lamp 4 ft.
6 ft.
8 ft.
10 ft.
12 ft.
14 ft.
16 ft.
18 ft.
20 ft.

FIG. 1—ILLUMINATION CHART FOR EXTERIOR ILLUMINANTS

NOTE.—The dotted irregular curve is the horizontal illumination characteristic curve (scale B) of a 100-watt "Mazda" lamp, clear bulb, fitted with an MM 12-in. diffuser, and is shown to illustrate the method of using this chart. The dotted lines show how to proceed in order to find the horizontal illumination from this lamp at a point located 5 ft. laterally and 10 ft. horizontally with respect to the lamp when the latter is at an elevation of 8 ft. (0.37 ft.-candle, scale B). If the illumination at a point on a line immediately below the lamp is required, proceed upward directly from the "horizontal distance from lamp" axis to the correct "height of lamp" curve, etc. Given the illumination, proceed in the reverse order to find the various heights and distances at which it may be obtained. Points for plotting the characteristic curve of a lamp are obtained from its distribution curve by multiplying the candle-power $P$, at various angles ($x$), measured from the vertical, by $\cos^3 x$ when horizontal illumination is desired and by $\cos^2 x$ for normal illumination. Use one of the upper scales and the right-hand scale of degrees for plotting these points and draw a smooth curve through them.

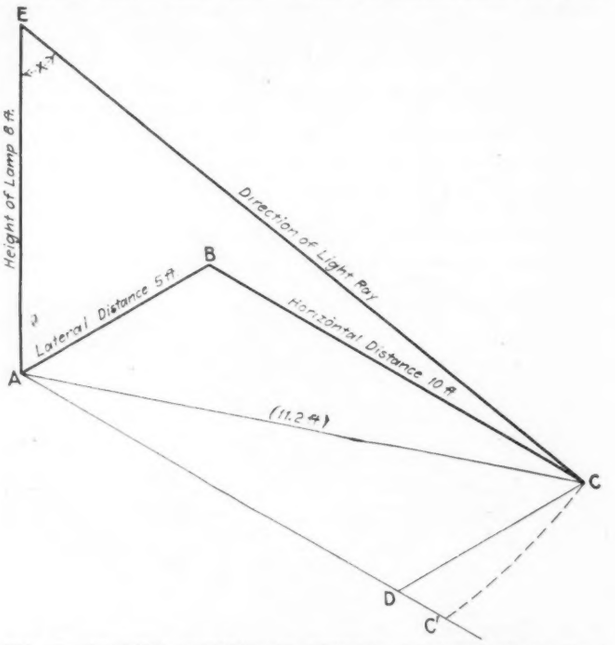


FIG. 2—GRAPHIC METHOD OF FINDING ILLUMINATION AT A POINT ON A LINE PASSING DIRECTLY BENEATH A LAMP

obtained at an infinite number of points, but we have in mind a point on *BC*, when the lamp is stationed at a lateral distance of 5 ft. from this line and at an elevation of 8 ft. The problem is naturally indeterminate unless the elevation and lateral distance be so chosen as to limit the result to a single unknown quantity, namely, the horizontal distance of the point from the light source. It is in solving this latter problem (that is, given the illumination to find the various heights and distances at which it may be obtained) that the charts are exceedingly useful, for, as has just been mentioned, it is ordinarily necessary to draw several illumination curves, one for each elevation of lamp it is desired to consider, in order to solve this problem.

To find the illumination at a point on a line passing directly beneath the lamp, say at *D* (Fig. 2), proceed directly upward from the "horizontal distance from lamp" axis. At *D*, according to the chart, the illumination (horizontal) is approximately 0.475 ft.-candle.

With regard to Chart 2 (Fig. 1) it is only necessary to say at this point that a problem similar to the one outlined in connection with Chart 1 is given on it, and that in this case the dotted curve is the normal illumination characteristic curve of a 6.6-amp magnetite-arc lamp.

For reference it will be convenient to write down at once the three equations expressing normal ($\beta_n$), horizontal ($\beta_h$), and vertical ($\beta_v$) illumination at a point in terms of the height of suspension ($H$) of the light source above the illuminated plane, the angular displacement ($x$) of the light ray from the vertical, and its candle-power ($P$). They are

$$\beta_n = \frac{P \cos^3 x}{H^2} \qquad (1)$$

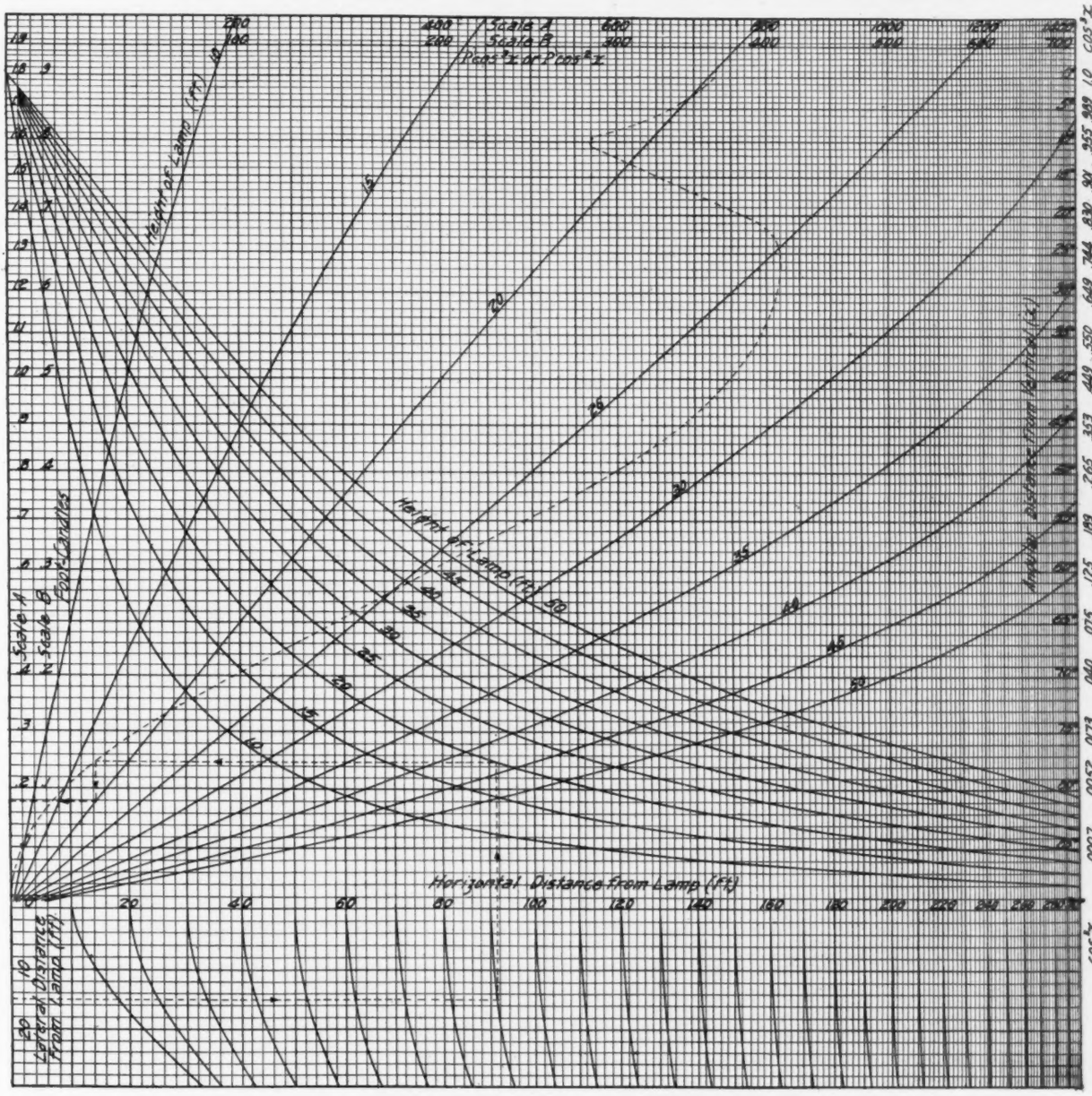


FIG. 3—ILLUMINATION CHART FOR INTERIOR ILLUMINANTS

NOTE.—The dotted irregular curve is the normal illumination characteristic curve (scale A) of a 6.6 amp magnetite-arc lamp and is shown to illustrate the method of using this chart. The dotted lines show how to proceed in order to find the normal illumination from this lamp at a point located 15 ft. laterally and 90 ft. horizontally with respect to the lamp when the latter is at an elevation of 20 ft. (0.177 ft.-candle, scale A). If the illumination at a point on a line immediately below the lamp is required, proceed upward directly from the "horizontal distance from lamp" axis to the correct "height of lamp" curve, etc. Given the illumination, proceed in the reverse order to find the various heights and distances at which it may be obtained. Points for plotting a characteristic curve of a lamp are obtained from its distribution curve by multiplying the candle-power, $P$, at various angles ($x$), measured from the vertical position, by $\cos^2 x$ or $\cos^3 x$ when normal or horizontal illumination respectively is desired. Use one of the upper scales and the right-hand scale of degrees for plotting these points and draw a smooth curve through them.

$$\beta_h = \frac{P \cos^3 x}{H^2} \qquad (2)$$

$$\beta_v = \frac{P \cos^3 x \sin x}{H^2} \qquad (3)$$

At present consideration will be given exclusively to equation 2, which is the equation for horizontal illumination. The first point to note about it is that $P$ and $x$ are

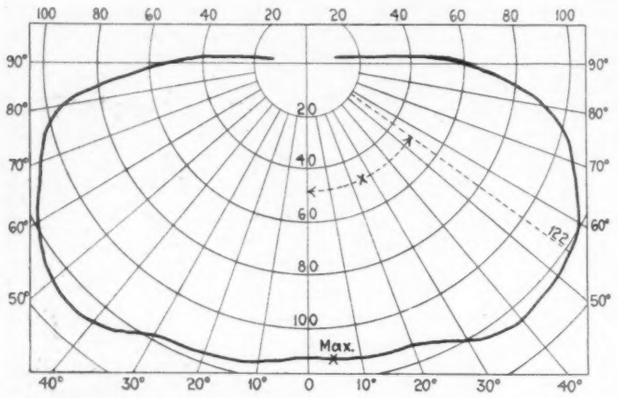


FIG. 4—DISTRIBUTION CURVE OF A 100-WATT TUNGSTEN LAMP, CLEAR BULB, FITTED WITH A DIFFUSER REFLECTOR

related or dependent variables. For example, referring to Fig. 4 it is seen that as the angle $x$ varies so does the candle-power $P$, according to a law which need not here be discussed. It is, therefore, plain that one may multiply the candle-power $P$ at any angular displacement $x$ by $\cos^3 x$ and deal with $(P \cos^3 x)$ values as a single number in equation 2 instead of $P$ and $\cos^3 x$ separately. In addition to having a "distribution curve" of a lamp, one may also have a "horizontal illumination characteristic curve," whose co-ordinates are $P \cos^3 x$ values and angular displacement from the vertical $x$. For the purpose in hand it will be convenient to use rectangular co-ordinates.

A portion of such a curve is given in quadrant 2 of Fig. 6, where the abscissas are $P \cos^3 x$ values and the ordinates are degrees displacement from the vertical. The complete curve is given in Fig. 3. Points for plotting this curve, as has just been indicated, are obtained from the candle-power distribution curve of the lamp, or where available, directly from illumination test records, by multiplying the candle-power values at any angle by the cosine cubed of that angle. For example, from Fig. 4, the cp of the lamp at an angle of 50 deg. is 125; $\cos^3 50$ is 0.265. Hence, $P \cos^3 x = 125 \times 0.265 = 33.1$, which gives the point $A$ on the characteristic curve in Fig. 6. From fifteen to twenty minutes is required to compute the points for such a curve, plot them and draw the curve, when a slide-rule and a French curve are available.

It has already been noted that the intensity of a light ray from a lamp and its angular displacement are related variables; knowing the angular displacement and having the characteristic curve of the lamp plotted, one may readily find the corresponding $P \cos^3 x$ value. But the angular displacement of the light ray which illuminates a particular point depends upon the height of suspension of the lamp and its lateral and horizontal distance from the point. The problem, therefore, now is to provide a means for determining the angular displacement for any height of lamp and lateral and horizontal distance.

Returning to the example illustrated by Fig. 2, the problem is to find the value of the angle $AEC = x$. The first step will be to find $AC$, the hypothenuse of the triangle $ABC$. This is done in quadrant 4, Fig. 6. Thus, $AC = \sqrt{5^2 + 10^2} = 11.2$; which is the value obtained by projecting to the curve in quadrant 4 from the 5-ft. point on the lower vertical scale of lateral distances and thence upward to $B$. The lateral distance of 5 ft. may therefore be considered as adding 1.2 ft. to the horizontal distance from the lamp. This step is so simple as to require no further explanation. Proceeding, it is seen that

$$x = \text{arc tan} \frac{AC}{AE} = \frac{11.2}{8} = 1.40.$$

Therefore, $x = 54$ deg. 35 min., roughly, which is the value obtained by traveling upward from $B$ to $C$ and leftward to $D$ in Fig. 6. The curve in quadrant 1, consequently, expresses the relation, using geometric terms, between an angle ($x$) of a triangle and the opposite leg, which latter is the horizontal distance from the lamp when the adjacent leg, which is the height of suspension, is constant (8 ft. in this case). It is quite evident that a series of such curves, one for each height of suspension, may be plotted. Points for plotting them are found from the relation just explained. Thus, for the 8-ft. "height of lamp" curve one pair of co-ordinates would be 45 deg. and 8 ft., since the tangent of 45 deg. is 8/8, or 1.

Having found the angular displacement, 54 deg. 35 min. at $D$, Fig. 6, one is in a position to determine the $P \cos^3 x$ value, as explained in an earlier paragraph, by traveling from $D$ to the characteristic curve in quadrant 2 and then downward to $F$ on the left-hand horizontal axis, and it is 24.3. From equation 2 it is seen that the illumination ($\beta_h$) is obtained by dividing the numerator $P \cos^3 x$ by $H^2$. Therefore the last step will be to provide a way of performing this small operation. The numerator of this equation can readily be found from the quantities generally given in an illumination problem, as has already been explained.

The abscissa in quadrant 3 is $P \cos^3 x$ and for the ordinate a scale of foot-candles $\beta$ will be given. From equation 2 it is evident that $\beta_h$ and $P \cos^3 x$ vary directly, and that if $H$ is constant a straight line passing through zero will denote the relation between these two variables. Such a line is drawn in quadrant 3 for a constant height of suspension of 8 ft. For a complete chart a line for a number of different heights of suspension must be drawn. Continuing the illustrative problem, from $F$ one would travel to $G$ (since the "height of lamp" is 8 ft.), and at $H$ find the illumination to be 0.38 ft.-candle horizontal illumination.

A chart arranged as in Fig. 6, while convenient for explanatory purposes, would occupy considerable space and occasion considerable traveling in working out a problem. Both of these difficulties may be greatly reduced by revolving quadrant 2 about the $Y$ axis through 180 deg. so that it coincides with quadrant 1, and revolving quadrant 3 about the $Y$ axis into quadrant 4 and then about the $X$ axis so that it also coincides with quadrant 1. This plan

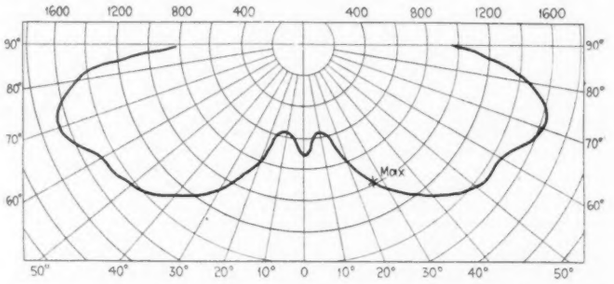


FIG. 5—DISTRIBUTION CURVE OF A MAGNETITE-ARC LAMP, EQUIPPED WITH A CLEAR GLOBE AND CONCENTRIC REFLECTOR

will give the arrangement shown in Figs. 1 and 3 and in no way change the relation existing between the various scales. The $P \cos^3 x$ scale will then fall along $OX'$ and the foot-candle scale along $OY$. It will be noted that the $P \cos^3 x$ scale and the scale of angular displacement are intermediate scales and are not necessary in solving a problem. For example, from $C$ one may pass directly to $E$,

not stopping to read the degrees at $D$, and from $E$ he may continue to $G$, having no need, so far as the solution of a problem is concerned, to note the $P \cos^3 x$ value at $F$. Except for the fact that these two scales are needed for plotting the characteristic curve of lamps, they might be erased. In the finished chart they are placed on the upper and right-hand margins, where they in no way interfere with the scales in more general use.

So far no mention has been made of equations 1 and 3, for normal and vertical illumination respectively. These equations are similar in form to equation 2 and differ from it only in the trigonometric function of $x$ of the numerator. Therefore, if normal illumination were desired instead of horizontal, it is plain that the scale which has been referred to as the $P \cos^3 x$ scale may represent $P \cos^2 x$ values, and a normal illumination characteristic curve may be plotted, using this scale in conjunction with the "angular distance from the vertical" scale. When using this curve the answers on the foot-candle scale will be foot-candles

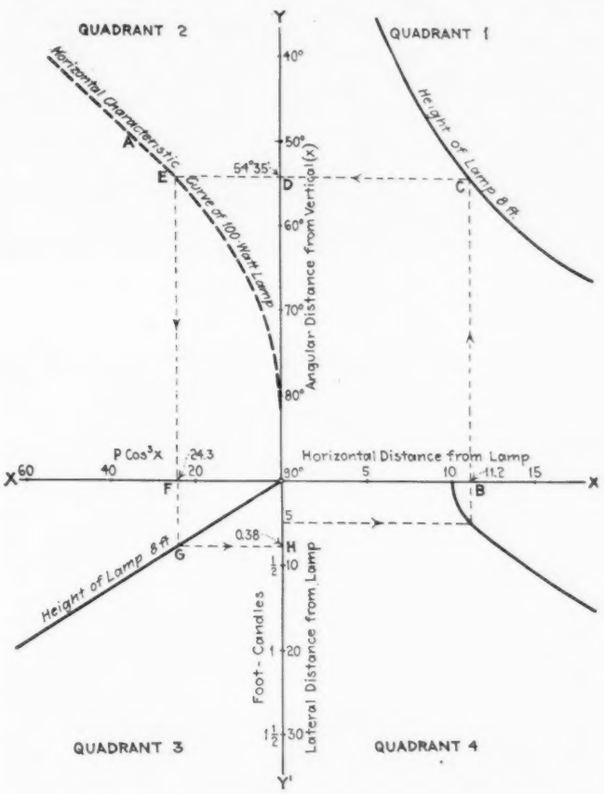


FIG. 6—GRAPHIC METHOD OF FINDING ILLUMINATION AT A POINT BY MEANS OF QUADRANTS

normal illumination. To obtain the vertical illumination from a lamp, its vertical illumination characteristic curve would be drawn in the same manner, one of the upper scale then representing ($P \cos^2 x \sin x$) values, and on the foot-candle scale the answer would be vertical illumination, when using this curve. On Chart 1 (Fig. 3) three foot-candle scales are given, namely, $A$, $B$ and $C$, and three corresponding scales $P \cos^3 x$ values are given. Scale $C$ is most convenient for plotting the characteristic curve of small units, that is, of less than 100 cp. For larger units it is necessary to use either scale $A$ or scale $B$. On Chart 2 (Fig. 1) only two scales are given, one suitable for the large-flame and the luminous-arc lamps, and the other for tungsten and other small units employed for exterior work.

Chart 2 is similar to Chart 1, except for the special cross-section paper. The peculiarity of this paper is that starting from the zero point and proceeding upward, downward and to the right the sections diminish in length according to an arithmetic progression. With this special paper it is possible to obtain a chart reading with accuracy over a wide range; for instance, from 0.01 ft.-candle to 2 ft.-candles and from 1 ft. to 300 ft. horizontal distance, within comparatively moderate limits. It is owing to this special paper that the "height of lamp" lines are curved instead of straight.

An interesting point is the manner of ascertaining the maximum illumination and its location. The characteristic curve on Chart 2 has a very pronounced maximum point, occurring at about 26 deg. from the vertical (see Fig. 5), as may be seen by glancing over to the right-hand scale of degrees (Fig. 1). To determine the value of the maximum illumination, say at 30 ft. elevation, move from the maximum point of the characteristic curve vertically to the 30-ft. "height of lamp" straight line, and then horizontally to the foot-candle scale, where the normal illumination is found to be 0.918 ft.-candle. To determine where this maximum occurs, move from the maximum point of the characteristic curve in a horizontal direction to the 30-ft. "height of lamp" curve line, and then vertically downward to the scale of horizontal distances, and it is found to occur at 15 ft. from the lamp. At an elevation of 25 ft. the maximum illumination increases to 1.32 ft.-candles and would be at 12.4 ft. from the lamp. The maximum point of the characteristic curve of the tungsten lamp is not so pronounced and is approximately 5 deg. from the vertical.

Sometimes with very large units, when great accuracy is desired, it may be found convenient to plot the lower portion of the characteristic curve, say from 90 deg. to 70 deg., to scale $B$ or $C$, and the remaining portion to scale $A$, bearing in mind that the illumination is to be read on the corresponding foot-candle scale. That is, if the part of the curve plotted to scale $A$, for instance, is employed in solving a problem, then the correct illumination will be found on scale $A$ of the foot-candle axis.

We have now completed the description of the method of construction of these charts, and have also considered the most important problems which they assist in solving. There are other points of minor interest, however, which might have had attention, such as finding the illumination on a wall or other vertical plane when the lamp is suspended vertically or the illumination from a lamp whose axis is at an inclination. Aside from the very great saving in time and labor which these charts make possible, in comparison with the customary methods of performing illumination calculations, it may be well to emphasize one or two other features. Errors will not, in general, exceed 2 per cent. When it is necessary to interpolate they are liable to increase to 5 per cent, unless special care is taken. Charts printed on paper suitable for blue-printing are most serviceable. Tracings, each with the characteristic curve of a lamp on it (or perhaps two or three, one for each kind of reflector, etc.), may be made and blueprint copies filed in the same way that distribution curves are now filed in all illumination laboratories and engineering offices, either for use in making calculations in the laboratory and office or for distribution to prospective customers.

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## Two-Phase to Three-Phase Auto-Transformers

By Roy E. Uptegraff

Occasionally it is desired to transform from two-phase to three-phase or three-phase to two-phase, as the case may be, for the purpose of running a three-phase motor or other apparatus from a two-phase line, or vice versa. This may be accomplished by placing on each leg of a three-phase core single windings as shown in Fig. 1. Each leg is wound with sufficient turns for 115.2 per cent of the line voltage, and taps are brought out for 100 per cent and 50 per cent of the line voltage as shown.

For a better understanding of the two-phase and three-

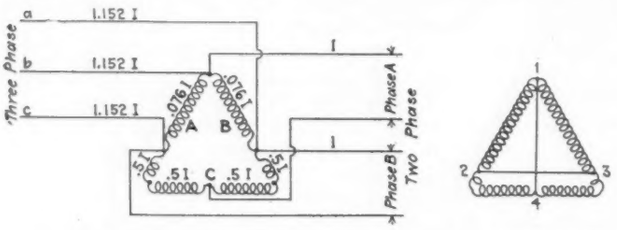
phase relation, reference should be made to Fig. 2. Lines 1 and 4 and 2 and 3 in the figure represent vectorally the two phases of the two-phase circuit since they are equal in length and at right angles to each other, the two-phase angle being 90 deg. Lines 1 and 2, 2 and 3 and 3 and 1 are equal and are at the angle of 60 deg. with each other, this being the three-phase delta angle.

If the current in the two-phase side be represented by $I$, the current in the three-phase lines will be 1.152 $I$, neglecting the magnetizing and loss currents. The currents in the three legs of the delta are not equal but are as shown in Fig. 1.

The winding in legs $A$ and $B$ required for 100 per cent of the voltage need be large enough for only 7.6 per cent of the two-phase current, while the extra 15.2 per cent of the winding must be designed for 50 per cent of the two-phase current. The current in leg $C$ must be designed for 50 per cent of the line current.

In explanation of the different currents in the windings it will be noted first that in Fig. 1 the apex of the delta is connected to one three-phase line and one two-phase line. Since the currents in the three-phase lines are equal to 1.152 $I$ and the two-phase current is $I$, then the current in the upper parts of sides $A$ and $B$ of the delta is $1.152\ I - I = 0.152\ I$, or 0.076 $I$ in $A$ and $B$ each from the apex to the tap. The rest of the sides $A$ and $B$ must be designed for the same current as in side $C$, as these are connected in series.

As the whole two-phase current flows into the middle of side $C$ as shown, it can be easily seen that 50 per cent of




FIGS. 1 AND 2—CONNECTIONS FOR TWO-PHASE AND THREE-PHASE TRANSFORMATION

this current will flow in each half and the lower parts of sides $A$ and $B$.

The size of standard three-phase transformer parts required for a two-phase-three-phase auto-transformer of this type is found as follows:

The value of the kilovolt-amperes in the sides $A$ and $B$ is $2\ (0.076\ I \times E + 0.5\ I \times 0.152\ E)\ 10^{-3} = 0.304\ I\ E \times 10^{-3}$.

The kva in side $C$ =

$$0.5\ I \times 1.152\ E \times 10^{-3} = 0.576\ I\ E \times 10^{-3}.$$

The total kva in the windings =

$$0.304\ I\ E \times 10^{-3} + 0.576\ I\ E \times 10^{-3} = 0.88\ I\ E \times 10^{-3}.$$

As this amount of power is transmitted through only one winding on each leg, while an ordinary two-coil transformer would have two windings on each leg, for this amount of power, in terms of an ordinary transformer, the rating would be equal to $\frac{0.88\ I\ E \times 10^{-3}}{2} =$ 0.44 $I\ E \times 10^{-3}$ in kva. The power in the line is $2\ I\ E \times 10^{-3}$. Therefore, the rating of the auto-transformer in terms of a standard transformer as a percentage of the line kva may be expressed as $\frac{0.044\ I\ E}{2\ I\ E \times 10^{-3}} = 22$ per cent.

The most desirable feature of the above auto-transformer over that of other methods for two-phase to three-phase transformation, according to the author's point of view, is its balanced operating condition. The above-described method of transformation was devised by Mr. William T. Taylor.

## Motor-Operated Wharf at Montgomery, Ala.

To accommodate the 50-ft. rise and fall in the Alabama River opposite Montgomery, Ala., an electrically operated municipal steamboat wharf has been installed, the feature of which is a movable unloading platform which can be lowered along an inclined trackway to the water's edge. As freight is unloaded from the barges onto this platform,

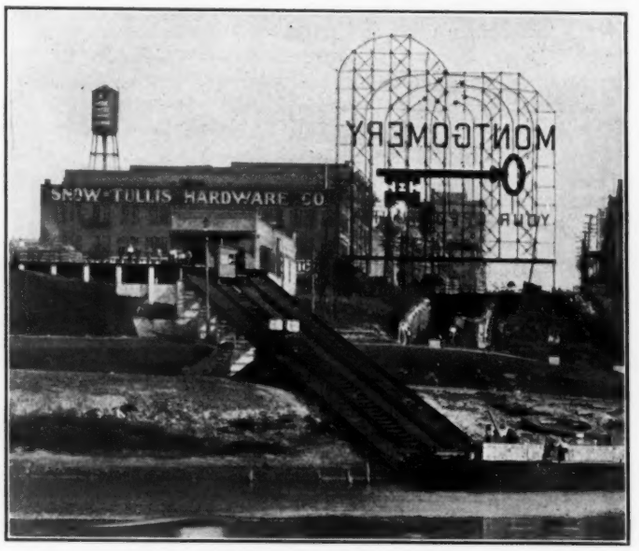



FIG. 1—GENERAL VIEW OF MOTOR-OPERATED WHARF AT MONTGOMERY, ALA.

small cars, also running on the inclined track mentioned, transfer the freight to wagons waiting at the top of the bank. The inclined trackway is 300 ft. in length and rises at an angle of 22 deg.

A 60-hp Westinghouse 500-volt direct-current motor furnishes power through a Lambert hoist mechanism to operate both the movable platform and the two 8-ft. by 12-ft. cars. The latter, of course, are in continuous operation while the wharf is in use, while the 30-ft. by 60-ft. platform

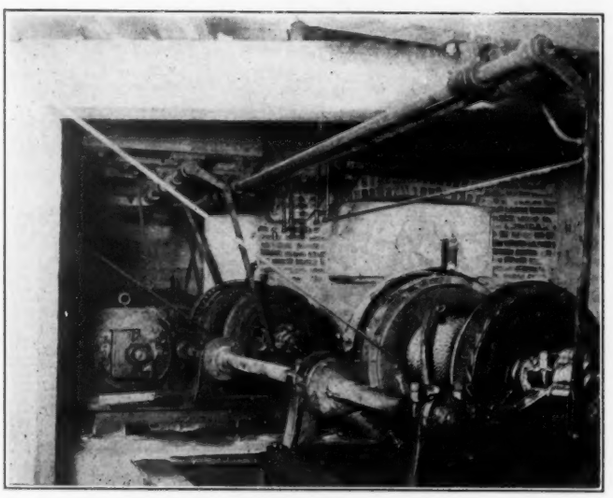


FIG. 2—MOTOR AND HOIST APPARATUS AT MONTGOMERY WHARF

need be moved only with changes in the stage of the river. Montgomery is at the head of all-year navigation on the Alabama River, being 410 miles up from Mobile and the Gulf. In the general view, Fig. 1, there is seen the rear of Montgomery's big "Key to opportunity" electric sign which faces the railway station.

# Central Station Management

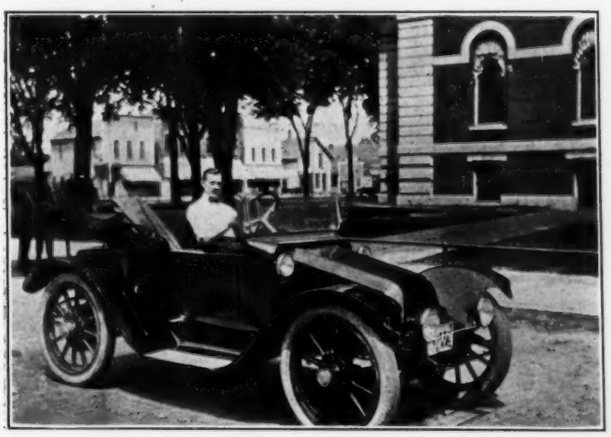
**Devoted to Discussion of Administrative Policies, Commercial Methods, and Current Practice Among Successful Utilities**

## Renting Tungsten Fixtures at Houston, Tex.

The Houston (Tex.) Lighting & Power Company has inaugurated a tungsten-fixture rental campaign, offering to present or new customers the use of a 250-watt pendant fixture, complete with 14-in. globe and 250-watt lamp, at the rate of 40 cents per month. More than 200 of these pendants are now in service at Houston and have shown surprisingly few renewals. In addition to the rental, the customer pays 12 cents per kw-hr. for the energy used. The first cost of the pendant is made up as follows: Lamp, $1.39; fixture, $1.50; shade, $0.75; total, $3.64.

## Electric Roadster in Difficult Run

Much attention was attracted recently in Chicago automobile circles by a run from Chicago to Cedar Lake, Ind., and return made by an electric roadster driven by Mr. Richard Mansell, Chicago retail branch manager of the Borland-Grannis Company. This is said to be the first time that an electric vehicle has been driven to Cedar Lake and



ELECTRIC ROADSTER IN DIFFICULT RUN

back. The distance, according to the speedometer on the car, is 97.2 miles and there are many grades and hills to negotiate. Because of the hills it had been thought impossible for an electric car to make the trip on one charge.

The car used was a stock car of the Borland company, having an equivalent of forty-two cells of eleven-plate high-cap exide batteries. The average speed during the run was 15 miles per hour.

## Street-Car Folder Advertising at New Orleans

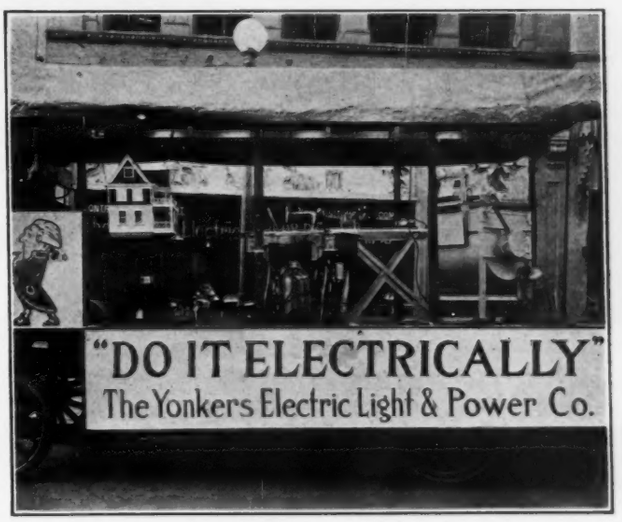
Each week the commercial department of the New Orleans Railway & Light Company issues 30,000 copies of its little central-station folder, "Railway Topics," which is distributed from boxes on the street cars of the company. During the tedium of a ride home or downtown the passenger without a newspaper is usually glad to avail himself of one of these breezy little four-page fliers, and for these minutes the central-station arguments it contains invariably have his undivided attention. "Railway Topics" is a four-page sheet, folded four times into one-column vest-pocket width. Besides the central-station propaganda, the pages are enlivened with many paragraphs in lighter vein, and there is usually an illustrated article on some energy-consuming device which the commercial department is pushing at the moment. This street-car folder, the New Orleans commercial staff declares, is one of the most valu-

STREET-CAR FOLDER

able forms of advertising available for a combination railway and lighting company where use can be made of the company's cars.

## A Moving Electrical Exhibit at Yonkers, N. Y.

In the accompanying illustration is shown one of the trucks displayed by the Yonkers Electric Light & Power Company in the automobile division of the "Bright Light




ELECTRICAL EXHIBIT ON TRUCK AT YONKERS, N. Y.

Parade" which was held at Yonkers, N. Y., early in September to celebrate the installation of 150 lamp-posts. "Do it electrically" and the company's name were painted in big letters on each side of the truck. The truck carried a miniature dwelling and various kinds of apparatus to be operated electrically from the central station's lines.

## Electric Service Data from Fort Worth, Tex.

Fort Worth, Tex., a city of 85,000 population, has 15,014 residences, in 10,022 of which electric service is in use. The Fort Worth Power & Light Company has in all 12,500 electric customers, of which number 500 are users of electric motors having a total connected load of 12,000 hp. All of the forty-four local hotels, including the million-dollar Westbrook, employ central-station service. Nine ice factories constitute the only isolated plants in the city, and even these are prospective users of central-station energy.

Nearly 10,000 electric irons are now in use, three-quarters of these having been sold during the last six months in a two-man campaign under an offer of 50 cents cash and three monthly payments of $1 each. The residence rate is 11 cents per kw-hr. for the first 2 kw-hr. per lamp per month, and 7 cents per kw-hr. for all thereover. In competition with this schedule natural gas is sold at 30 cents per 1000 cu. ft.

Fort Worth's new steam-turbine station has a present maximum load of 25,000 kw and is the central generating point for fifteen nearby towns, all within a radius of 150 miles.

## Electric Iron Exchange Sale at Marion, Ind.

Following the publication of the accompanying advertisement in the daily papers of Marion, Ind., announcing that the Marion Light & Heating Company would give

BRING IN YOUR OLD IRON AND EXCHANGE IT FOR A NEW ONE

One that is guaranteed for five years. This does not mean only Electric Irons, but any kind of an iron from the old fashion sad iron up. We are going to give every lady in Marion a chance to secure one of the very latest type irons on the market, between the 1st and 10th day of July for $2.25 and their old iron. Don't look forward to ironing day with dread, but do as your neighbors do and do your ironing with an Electric Iron. They are now used in twenty-six hundred homes in Marion, ought this not be strong proof that the Electric Iron is the kind you want in your home. Don't miss this opportunity to dispose of your old sad iron. After using the Electric you will realize why they call your old one the sad iron. Remember you must have an old iron of some kind to get a new one for the above price.

MARION LIGHT & HEATING COMPANY

FIG. 1—FLATIRON ADVERTISEMENT OF MARION COMPANY

a new electric flatiron with a five-year guarantee to each person bringing in an old iron and paying an additional $2.25, the office of the company began to resemble the storeroom of a dealer in scrap iron. As the end of the sale was approaching the old irons were arrayed upon a table to have their picture taken. The photograph shows the result of the ten days' sale. At the end of that period

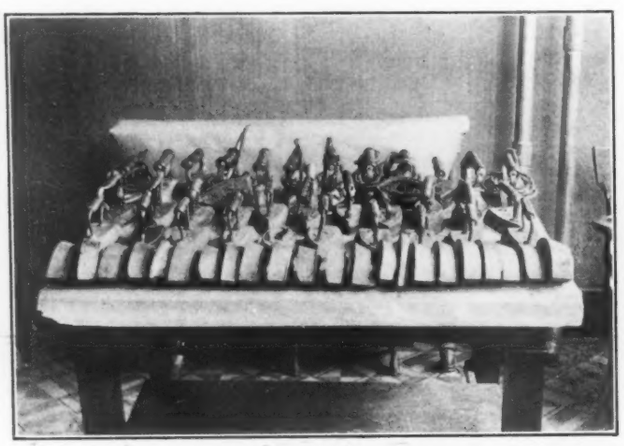


FIG. 2—OLD IRONS RETURNED IN CAMPAIGN AT MARION

the company was the possessor of sixty-seven old sad-irons and also of sixty-seven new electric iron users on its circuits. Considering that there was one electric iron in use for each seven and one-half persons in the city before the sale began the results accomplished are worthy of notice. Mr. Homer Gant is contract agent for the Marion company.

## Exceeding the Saturation Limit at Athens, Ga.

A round thousand electric irons are now in service on the lines of the Athens (Ga.) Railway & Electric Company, the last 202 having been added during a recent finishing campaign in which messenger boys delivered "blind" packages to the customers' doors. These 202 represent the number placed out of an original order of 225, although counting those returned and later shipped out again some 300 deliveries were made in all. The irons were delivered by messenger at a cost of 10 cents per package. Next day the salesmen followed over the routes and in most cases closed contracts with the housewives. These agents were paid on commission, receiving 50 cents for each iron sold. Purchased in quantities the irons cost the company $2.06, and they were sold to customers for $3. Mr. A. H. Sikes, sales manager of the company, had charge of the campaign.

## Large Sub-Aqueous Coal-Storage Basin at Indianapolis

For the storage of coal under water the Indianapolis Light & Heat Company has put into service at its Mill Street generating station one of the largest sub-aqueous coal-storage bins in the country connected with an electric service plant. The basin is built of concrete, the bottom and side walls being from 1 ft. to 1.5 ft. thick, reinforced with 0.5-in. twisted steel rods. The pit measures 100 ft. wide, 300 ft. long and 18 ft. deep below the water line. It affords space for storing about 15,000 tons of coal under water, and an equal quantity may be heaped above the water line, making a maximum storage of 30,000 tons. The plan will be to store below the water level coal which is rich in sulphur and cheaper in price, placing above the water line qualities not containing ingredients apt to ignite by spontaneous combusion.

In the bottom of the pit 40-lb. T-rails are laid longitudinally and spaced 18 in. from center to center. The heads of the rails project 0.5 in. above the concrete, protecting the latter from the scraping of the grab-bucket. A row of concrete piers placed on 15-ft. centers extends lengthwise through the middle of the pit. These piers support a trestle

FILLING COAL-STORAGE BASIN AT INDIANAPOLIS, IND.

with a standard-gage track at grade level. A 15-ton Brown steam locomotive crane travels back and forth on this trestle and handles the coal on both sides with a 2-yd. coal grab-bucket, suspended on a 40-ft. boom. Crane and bucket are both operated by one man from his stand in the cab. As the crane is self-propelled and equipped with trucks, couplers and steam brake, it does the switching

of the cars off and on the trestle. The coal cars are run out on the trestle with the crane and dumped, and when the coal is required in the power house it is loaded into cars by the crane and is then carried to the boilers. The ties on this track constitute the only wood employed in the pit construction.

A 7.5-hp, 4-in. centrifugal pump is used to fill the pit, obtaining its water from the condensing-water well of the station, which is supplied in turn from a creek that has been dammed to secure a constant supply of condensing water. The cost of building this basin was about $25,000. The pit was designed by Mr. Thomas A. Wynne, general superintendent of the company, and was built under his supervision.

## The Double Fallacy of Flat Rates for Steam Heating

The accompanying table presents the experience of a central station in a Western town of 8000 population with its flat-rate and metered steam-heating customers. The analysis was made in detail for every customer on this company's lines with a view to locating those installations in which the contracted "hours of usage" had been most flagrantly violated. Those who are shown up as having deliberately wasted steam will be notified that this must not continue during the coming season and a watch will be kept to see if proper care is taken to use and not abuse the steam. The table will also be used to convince customers that certain things are wrong with their systems. The company will point out these faults and will help to get the consumptions down to what they should be. As contracts for flat-rate steam usage expire, they will not, however, be renewed.

The table makes itself clear, except perhaps as to the percentage column in the flat-rate division. Here the total receipts from the meter customers were divided by the total steam in thousands of pounds used. This was considered as unity and the "cents per 1000 lb." received from each flat-rate customer was divided by this figure. In other words, the various percentages after the flat-raters are the percentages of revenue the company received from the flat-raters as compared with the percentages received from the meter users.

Summing up the results presented in the table, it is shown that compared with the metered users the flat-raters used 106 per cent more steam per 1000 cu. ft. and 111 per cent more steam per square foot of radiation. They paid $1.15, or 41 per cent, more per 1000 cu. ft. and 10 cents, or 44 per cent, more per square foot of radiation.

On the other hand, the company received 31.6 per cent less revenue per 1000 lb. from the flat-raters than from the meter users.

Thus, as the manager laconically expresses it, "We both lose." After inspecting the above figures, no further expression is required of the company's opinion of flat rates. It began service two seasons ago "without a great deal of knowledge of steam-heating and connected up some buildings we would not have taken on had we had our present experience. All in all we did succeed in getting some high rates for flat-rate usage," concludes the manager, "but it will be readily seen that we lost from the standpoint of cents per 1000 lb. sold."

1912-1913 SUMMARY OF HEATING SERVICE, TOWN OF 8000 POPULATION

| No. | Class of Service | Contents, Cu. Ft. | Radiation, Sq. Ft. | Total Condensation, Lb. | Condensation per 1,000 Cu. Ft. | Condensation per Sq. Ft. Radiation | Ratio, Radiation to Cubic Content | Amount Received per 1,000 Cu. Ft. | Amount Received per Sq. Ft. Radiation | Percentage of Revenue |
|---|---|---|---|---|---|---|---|---|---|---|
| **Metered Customers Using Steam Entire Season** | | | | | | | | | | |
| 1 | Grocery and meat store | 20,187 | 176 | 56 | 2,772 | 318 | 1:115 | $2.31 | $0.27 | |
| 2 | Flat | 18,872 | 511 | 152 | 8,055 | 297 | 1:37 | 5.71 | 0.21 | |
| 3 | Bank | 19,964 | 329 | 176 | 8,918 | 541 | 1:61 | 6.75 | 0.41 | |
| 4 | Bank | 25,594 | 504 | 172 | 6,721 | 341 | 1:51 | 4.47 | 0.23 | |
| 5 | Office | 10,005 | 270 | 98 | 9,800 | 363 | 1:37 | 8.18 | 0.30 | |
| 6 | Printing and telegraph office | 92,651 | 1,443 | 674 | 7,275 | 467 | 1:64 | 3.99 | 0.26 | |
| 7 | Garage and machine shop | 152,353 | 542 | 186 | 1,221 | 343 | 1:281 | 0.85 | 0.24 | |
| 8 | Lodge | 55,013 | 802 | 166 | 3,018 | 207 | 1:69 | 2.21 | 0.15 | |
| | Totals—Total season metered customers | 394,639 | 4,577 | 1,682 | | | | | | |
| | Averages—Total season metered customers | | | | 4,262 | 368 | 1:86 | $2.80 | $0.24 | |
| **Flat-Rate Customers Using Steam Entire Season** | | | | | | | | | | |
| 1 | Bank, drugs and offices | 63,402 | 926 | 787 | 12,413 | 850 | 1:68 | $6.31 | $0.43 | 77.5 |
| 2 | Jewelry store and offices | 34,408 | 450 | 280 | 8,140 | 622 | 1:76 | 4.19 | 0.32 | 77.5 |
| 3 | Stores and room house | 65,613 | 870 | 625 | 9,527 | 718 | 1:75 | 5.34 | 0.40 | 85.1 |
| 4 | Store and offices | 130,828 | 1,833 | 1,170 | 8,945 | 638 | 1:71 | 3.23 | 0.23 | 54.7 |
| 5 | Stores | 296,493 | 2,365 | 2,029 | 6,843 | 858 | 1:125 | 3.13 | 0.39 | 69.8 |
| 6 | Saloon and rooms | 33,133 | 524 | 485 | 14,652 | 926 | 1:63 | 5.59 | 0.35 | 57.7 |
| 7 | Theater and rooms | 50,668 | 610 | 615 | 12,130 | 1,008 | 1:83 | 6.31 | 0.52 | 79.6 |
| 8 | Office | 4,384 | 125 | 103 | 23,462 | 824 | 1:35 | 10.25 | 0.36 | 66.8 |
| 9 | Photograph gallery | 20,144 | 249 | 317 | 15,771 | 1,273 | 1:81 | 4.10 | 0.33 | 39.5 |
| 10 | Office | 6,104 | 150 | 90 | 14,754 | 600 | 1:41 | 5.90 | 0.24 | 60.8 |
| 11 | Store and rooms | 37,009 | 652 | 370 | 10,000 | 567 | 1:57 | 4.05 | 0.23 | 62.3 |
| 12 | Store | 32,000 | 580 | 342 | 10,687 | 590 | 1:55 | 4.96 | 0.27 | 69.8 |
| 13 | Flat | 13,287 | 199 | 178 | 13,393 | 894 | 1:67 | 5.04 | 0.34 | 57.7 |
| 14 | Garage | 79,534 | 310 | 234 | 2,943 | 755 | 1:257 | 1.77 | 0.45 | 91.1 |
| | Totals—Total season flat-rate customers | 867,007 | 9,843 | 7,625 | | | | | | |
| | Averages—Total season flat-rate customers | | | | 8,795 | 775 | 1:88 | $3.95 | $0.35 | 68.4 |

## An Electric Fan with Many Uses

An enterprising negro bootblack in a small Indiana town has solved the problem of making his 6-in. electric fan a paying proposition for himself as well as for the central-station company. While he is putting the polish on the customer's shoes the fan is placed where its breezes cool the perspiring patron. The base of the fan is not fastened down, so that later, when shoes are to be dried, the blast from the whirling blades can be directed against the footware. At times when customers are few the bootblack uses the fan for his personal comfort, declaring that even if there were no customers for a whole day he would not regret the slight expenditure as long as he himself could be the beneficiary of the fan's cooling draft.

# Illumination and Wiring

## Street Lighting in Fort Wayne, Ind.

That part of the business district of Fort Wayne, Ind., including Calhoun Street from Superior Street to the Pennsylvania depot, a distance of about ten blocks, and four blocks of each of the three principal streets crossing Calhoun Street, is now being lighted by ornamental iron posts carrying five-lamp clusters of tungsten lamps. The city at present is operating 195 of these units, and there are besides a number of posts which were purchased by individuals where the spacing of 90 ft. was not satisfactory to the owners of the property.

The posts stand about 15 ft. over all above the street. The white alba globes surmounting the top of each post are 16 in. in diameter and inclose a 60-watt tungsten lamp,

FIG. 1—TUNGSTEN LIGHTING AT FORT WAYNE, IND.

while the four lower globes are 12 in. in diameter and are lighted by 40-watt lamps. The four lower lamps are operated until 11 p. m. and the top lamp remains lighted all night. Switching is accomplished automatically by means of time switches that are contained in the base of the posts.

To economize and at the same time to reduce the walk obstructions, fire-alarm boxes are hung on the corner posts, and at each station of this kind a red band painted on the 16-in. globe bears the words "Fire Alarm" in white letters. It is stated that the cost of this type of installation was approximaely $1.50 per front foot. Sixty more units of the same type will be installed within the next few months on Washington and Jefferson Streets.

In order to provide an opportunity for the residents of the city to contrast the tungsten lighting and the inverted magnetite-arc lamps, two blocks on Columbia Street have

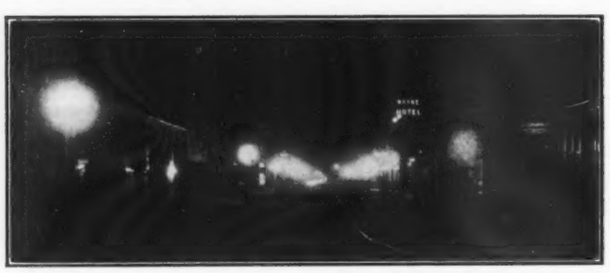


FIG. 2—MAGNETITE-ARC LAMPS AT FORT WAYNE, IND.

been equipped with the latter system. The twelve lamps in this installation are staggered 90 ft. apart and are mounted on ornamental iron standards. The installation of 190 of these lamps is now contemplated in the outlying residence districts of the city. Mr. Frank Dix, who is chief electrician for the city, states that the maintenance charge on the tungsten lighting will somewhat exceed that of the magnetite-arc lamps.

The ornamental iron posts were made in the foundry of the Kerr-Murray Works, a manufacturing concern in Fort Wayne, Ind.

## Changing 35,000-Volt Insulators on Live Circuits

To change insulators on a 35,000-volt transmission line while several large glass factories are taking energy from the line is rather an uncommon feat. Such work was, however, performed by a lineman of the Marion (Ind.) Light & Heating Company on one of its transmission lines not far from the city limits. A common hand-axe handle

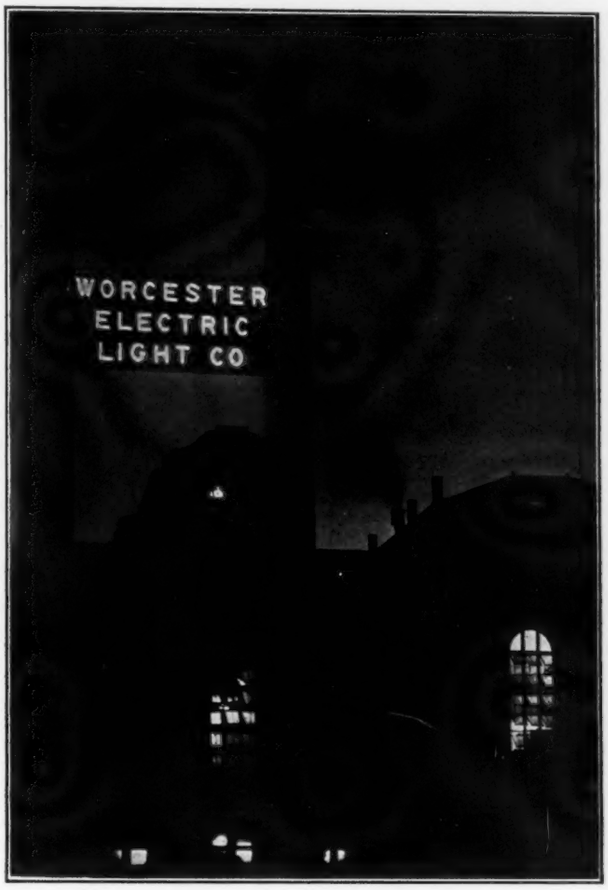
CHANGING 35,000-VOLT INSULATORS ON LIVE CIRCUITS

made into a wrench and insulated with four thicknesses of varnished cambric held in place with friction tape was used to free the line from the insulator. The handlines used in the operation were baked over night in an oven to drive out all moisture. In a very short time the broken insulator, which may be distinguished in the illustration, was removed and a new one put in its place. The fact that the wishbone cross-arms on the line were all grounded made the feat an exceptionally perilous one.

## A Noteworthy Central-Station Chimney Sign

At its 13,500-kw generating station on Webster Street, Worcester, Mass., the Worcester Electric Light Company has recently erected a large double electric sign as shown in the accompanying illustration, making one of the most conspicuous display advertisements in the city. When the plant was built provision was made in the concrete chimneys for the attachment of such a future sign, steel plates suitable for holding fabricated steel shoes being embedded in the chimney walls. This sign bears only the company's name, but it is 56 ft. long and 18 ft. high. The letters are 4 ft. high, the top of the structure being 120 ft. above the street. The sign, which is double, just spans the distance between the two stacks, each of which is 175 ft. in height. The illumination is furnished by 800 5-watt, 11-volt tungsten lamps, half the lamps being on each face. The sign was built by the American Publicity Company, of Worcester, and is operated nightly from dusk until dawn. The frame is of steel angles assembled on the ground. Erection was effected by the use of heavy hooks, blocks and tackles at the top of each chimney, with other blocks near the

ground through which the hoisting cables passed on their way to a steam engine at the street level. After the frame was hoisted into place it was attached to the plates above-mentioned by shoes. The weight of the sign complete is




CENTRAL-STATION CHIMNEY SIGN

about 6 tons. It can easily be read at a distance of over a mile from the station.

## Operating Results with a 2300-Volt Single-Wire Ground-Return Transmission Line

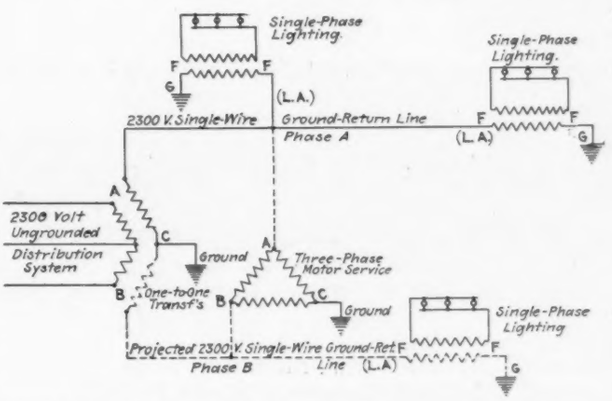
In April of this year the Benton Harbor-St. Joseph (Mich.) Railway & Light Company began the construction of a 2300-volt single-wire ground-return transmission line, employing the scheme outlined in our issue of Aug. 3, 1912. Regular service began June 1, and since that date the system has been continuously in operation, according to Mr. J. A. Cavanaugh, superintendent for the company.

For the purpose of the severest possible test, this single-wire grounded line was built under the most adverse conditions that such a line could be expected to meet. A telephone company already had a line of poles along the route, carrying a rural-line circuit of two wires on brackets. Permission was obtained to reconstruct this line by placing a standard 5-ft. four-pin cross-arm in the top gain of these 25-ft. poles, transferring the telephone wires to two pins on one side of the arm and running the 2300-volt wire on the outer pin at the far side. The single-wire line thus built is approximately 2.5 miles long. Triple-braided weatherproof wire was used throughout for both primaries and secondaries. Owing to delay in securing the one-to-one transformers desired for connecting the ground-return line with the company's ungrounded system, a pair of standard distribution transformers were utilized, their secondaries being connected together to take the place of the one-to-one units.

Customers' secondaries, it will be noted, are not grounded, and all possible effort is made to prevent such grounding. Lightning arresters are installed at every transformer. Transformers are fused between terminal and ground and between the primary wire and ground. Both secondary and transformer construction is of the company's standard type, the second or grounded wire of the primary being run to a No. 4 rubber-covered conductor, which is nailed to the pole and covered with special wood molding. This ground wire connects with both a 24-in. copper ground-cone buried in moist earth, with one sack of charcoal around the cone, and a 0.75-in. galvanized ground-pipe driven deep into the earth at the base of the pole. In some cases it was necessary to go back two or three poles to find lower ground which would retain moisture better.

Leaving the main transformers, at the end of the first five poles, it became necessary to cross a millpond with a 575-ft. span. This was done with a single messenger and two No. 8 triple-braided weather-proof wires carried on a specially insulated hanger so arranged that if necessary the entire span could be drawn in at either end and any necessary repairs made directly from the pole. Two wires were carried across this millpond in the expectation that a little later the second phase might be run out on another circuit, thus assisting in balancing the system.

When first starting a great deal of trouble was experienced with induction on the telephone lines. Finally the telephone wires were transposed every fifth pole, using standard Michigan Telephone Company transpositions. This helped the matter, but there was still considerable noise caused by grounds where the primary line ran through trees, some sections of the line traversing heavy maple, elm and willow shade trees. This trouble was only partly cleared up before the men were called away. After the line had gone through several severe electrical storms the men were again put on the line, thoroughly clearing it of all tree grounds, etc. While there is still a slight buzzing, caused by induction and noticeable when using the rural telephone, it cannot be detected at the other end of the line and the voice transmission is perfectly clear and normal. Mr. Cavanaugh also reports that he has not had a single fuse on this line put out by lightning, either on the transformers or in residences. At present there are no motors on the line, but one of the customers is getting ready to




SINGLE-WIRE GROUND-RETURN TRANSMISSION, SHOWING PROVISION FOR THREE-PHASE MOTOR SERVICE

install a 5-hp single-phase motor, which will give further data on operation.

The aim in installing the single-wire circuit in such a questionable position as on the telephone poles was that the tests might be made under the most adverse circumstances possible. Thus far, Superintendent Cavanaugh has felt thoroughly satisfied and has expressed the belief that

with a properly constructed pole line on a private right-of-way, avoiding heavy trees such as shade many rural highways, single-wire lines can be built much more cheaply than the standard two-wire construction and with less danger from high winds, sleet and other line troubles. A line of this character using 25-ft. poles with 5-in. tops costs about $228.65 per mile as itemized in this table:

| | |
|---|---|
| Thirty-five 25-ft. poles (5-in. tops), at $2.50 | $87.50 |
| Five 35-ft. poles, at $3.65 | 18.25 |
| Thirty-five wood brackets, at 2 cents | 0.70 |
| Five four-pin cross-arms, at 40 cents | 2.00 |
| Twenty wood pins, at 2 cents | 0.40 |
| Forty glasses, at 2 cents | 0.80 |
| Bolts, lags, etc | 1.00 |
| 400 lb. No. 8 triple-braided weatherproof wire, at 17 cents | 68.00 |
| Labor | 50.00 |
| Total | $228.65 |

A line of equivalent capacity constructed of the same material, but employing the usual two wires instead of one, would cost $380.30 per mile, a difference of $151.65 per mile. It will be noted in the above tabulation that no estimate has been made for the necessary amount of two-wire line where transformers were installed, nor for the grounding of transformers. The latter costs about $5 per transformer.

### Recent Telephone Patents

Improved Receivers

The mechanical details of the telephone receiver are under continual improvement, and this improvement involves practically every part, from magnetic system to shell. Some recent work of this kind is covered by three patents granted to different inventors, all assigned to the Western Electric Company and all describing different improved methods of assembling the magnetic system.

In the invention of Messrs. E. B. Craft and N. Reynolds, the magnet is built up of straight bar stock, the yoke and soft-iron pole pieces being electrically welded together. The cup piece is held in position by bolts extending through the yoke. Mr. V. Anderson varies this method by securing the cup during the welding process. To this end the cup is perforated with slits slightly narrower than the pole pieces, the end of these pole pieces being reduced to fit. The parts are adjusted so that when the pole pieces are welded to the magnet proper the cup will be clamped rigidly.

In his patent, Mr. J. J. Lyng provides for a notch in the base of the pole piece, leaving two projecting legs. These legs register with perforations in the cup pieces so that when the legs are welded to the magnet the cup is secured.

## Letters to the Editors

### The Nose-Mouth Telephone Transmitter

*To the Editors of the Electrical World:*

Sirs:—Permit me to call attention to an early anticipation of the much-heralded attachment to the long-distance telephone transmitter used by Dr. Glover in Paris. In United States Letters Patent, No. 341,288, on apparatus for recording and reproducing sounds, granted to Mr. Sumner Tainter, of Washington, D. C., dated May 4, 1886, and which forms the basis of the dictaphone as developed today, under the list of improvements, we read as follows: "It is found that a mouthpiece which concentrates the sound is desirable to increase the strength of the record, that a mouthpiece which *covers the nose* is desirable to convey the nasal as well as other vibrations, etc."

In view of the fact that Messrs. C. A. Bell and S. Tainter worked together on phonetic apparatus for years and were experts on acoustics and phonology in general, it is evident that Dr. Glover's invention has been clearly anticipated in principle. It has perhaps not been a commercial necessity to supply nose-pieces with the dictaphone, but under modern conditions of constant use of such apparatus we shall doubtless soon reap the benefits of this old-new discovery.

*Manila, P. I.* O. C. Roos.

### The Cost of Factory Motor Service

*To the Editors of the Electrical World:*

Sirs:—In the issue of the *Electrical World* dated Aug. 23, 1913, there appeared an article entitled "Investigation of Cost of Motor Drive in a Six-Story Factory." This article closed with a tabulation of the costs of motor drive with central-station energy and the cost of operation by mechanical drive from the mill engine.

Without going into the undisputed advantages of electric drive, the writer wishes to take exception to the method of arriving at the actual yearly cost of operating the plant by the two methods. Under the heading of "Fixed Charges" there appears for both the steam and electric plant an item entitled "profit," the charge being 10 per cent on the plant cost. Why should the power equipment be burdened with charge for profit? Power is an absolute necessity in practically every line of manufacturing, just as necessary as the operatives in the factory or the building itself, yet it is not believed that an item of profit is charged against the employees' yearly salaries or the money invested in the buildings.

Including this item of 10 per cent, the yearly cost of the steam plant, fixed charges and operating expenses totals $12,545.30, while for the electric motor equipment the total is $11,875.50, a so-called saving by the use of electric drive of $669.80. Eliminating the item of profit from the fixed charges, the totals are $10,850.30 for steam drive and $11,467.20 for electric operation, resulting in an actual saving of $616.90 yearly by the use of the steam equipment, accepting the other charges as correct. Although as stated previously the electric drive is undoubtedly the more desirable of the two, the extremely questionable charge of a profit against an absolute necessity is what turned the tide in favor of the motor drive. Furthermore, it was not stated what was done with the abandoned steam equipment. Had this equipment about run its useful life and had the depreciation fund reached such proportions that the plant could be written off the books and this fund applied to the new equipment, or was the plant in good condition with a considerable life ahead of it? If the latter condition existed, it is only fair to the stockholders of the concern that the burden of the remaining amortization charges, less the salvage value of the plant, be included in the cost of the motor drive.

A charge of profit against a part of the money invested in motor-service equipment should be made under the following conditions: The question of central-station service or an isolated plant is being considered for the industrial requirements of a mill. Let us assume that, as regards manufacturing processes, service from either source would be equally satisfactory. If the isolated-plant installation would cost say $35,000 and the motor equipment for central station drive $20,000, the estimates of the yearly cost of the former service should include a charge of the average percentage profit of the industry on the $15,000 extra cost of the plant, for the reason that, if not put into the motor-service equipment, this sum would be available as working capital for the business and thus earn a profit.

Unfortunately, factory motor-service costs seem to be more or less a matter of bookkeeping, quite a few of the published costs being about as definite as an expression of steam consumption per kilowatt-hour without any mention of pressure, superheat or vacuum.

*Washington, D. C.* Frank T. Leilich.

# Field of the Operating Engineer

**A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers**

## Electrically Propelled Inclined Railway for Unloading Coal

Along the shores of the Ohio River there are now in use two electrically propelled inclined railways for unloading coal from the barges which bring their supply from the Eastern coal fields. Both are operating very economically

FIG. 1—FRONT VIEW OF ELECTRICALLY OPERATED COAL ELEVATOR ON OHIO RIVER

and with far less attention than was necessary with the old-fashioned types driven by steam. One of these inclines is located at Louisville, Ky., and the other, shown in the accompanying illustrations, is at Cincinnati, Ohio. The Cincinnati elevator, owned by the Whetstone Coal Company, is constructed of concrete and has a total capacity of 800 tons.

The concrete portion of the structure measures 30 ft. wide by 70 ft. long, and the peak of the wooden housing which covers the elevator is 62 ft. above the ground. The elevator proper, which consists of three bunkers, is supported on twenty-four concrete piers, arranged in three rows, so that wagons may be driven beneath and filled with coal. On each of the two longer outside walls are seven coal chutes opening into the bunkers. Opening into the wagon drive beneath the bunkers are fourteen other chutes which catch any slack coal which can pass through a 4-in. screen. On the land side of the elevator is a coal storage space where the upper layers of coal from the barges can be dumped from the elevated track, as they do not contain much slack. The lower part of the barge load, which contains more fine coal, is stored in the elevator, where the slack can be separated more readily.

Running from the second-floor level of the elevator on the side facing the river to a point on the river bank where coal barges can be unloaded is an inclined double track which is about 380 ft. long. This track has a vertical drop of about 90 ft. and is supported on wooden trestle work firmly keyed to concrete piers which extend several feet into the ground. At the river end of the inclined track is an adjustable float which supports double tracks joining the inclined track at a slight vertical angle.

The cars are pulled up the incline by a steel cable wound on a drum gear driven by a 75-hp, 220-volt wound-rotor induction motor. There are two of these drums, one for each track, each drum being about 3 ft. in diameter. One car is thus pulled up while the other is going down. The controlling mechanism, which consists of a General Electric ten-speed forward and reverse controller and two sets of drum brakes (one mechanical and one electrical), is situated near an observation window on the side of the building facing the river, where the operator has a good view of the track.

An ingenious method is used for automatically unhooking the cars from the cables when they reach the top of the incline. The cable pulling the car, as shown in Fig. 2, is supported at the top of the incline by a pulley which is in turn supported by a rope running over another pulley and weighted at the other end. The traction cable ends in a steel eye which is slipped over a hook on the car. When the latter reaches the top of the incline the pulley supporting the slack in the cable raises the eye vertically off the hook and the car is free to continue along the level track

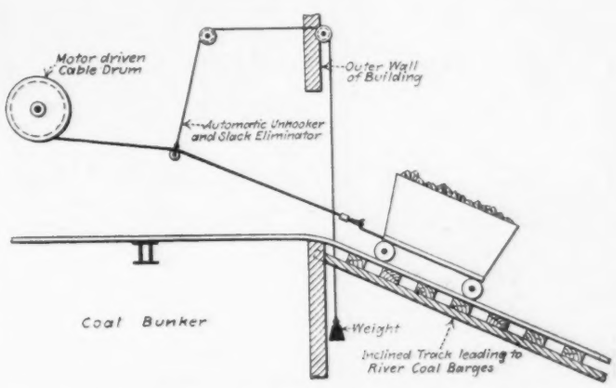



FIG. 2—ARRANGEMENT OF CABLES FOR HOISTING COAL CARS

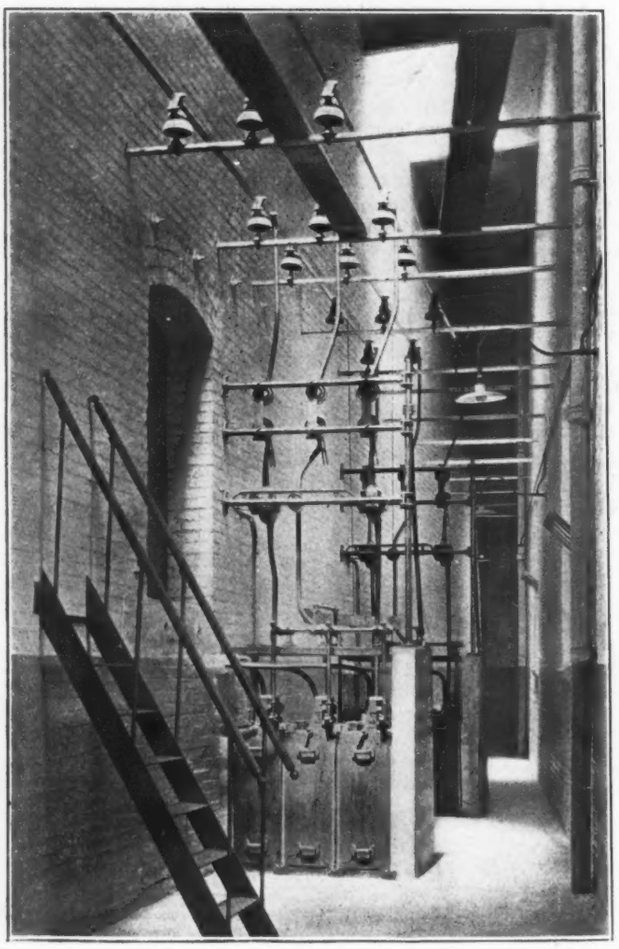
until it reaches the man stationed on the elevated track to dump it. This way of unhooking the cable from the car allows the motor to be kept running at full speed until the car is unhooked, as the automatic unhooker or "slack eliminator," as it may be called, will follow the cable and wind up on the drum. By allowing the motor to run without any slackening in speed the car is given an impulse sufficient to

continue along the elevated track to the point where the car dumper is located.

Under ordinary conditions from 150 to 200 cars are hoisted per day, but as many as 300 cars have been hoisted with a crew of three men—one for operating the hoist, one for dumping the cars, and one for operating the switch which is used when three cars are being worked at a time. Each car holds two tons and can be pulled up the incline in thirty seconds if necessary. The energy cost for pulling the cars is about 0.019 cent per ton of coal raised.

## Oil-Switch Installation in Restricted Space

An electric-railway company recently built a substation on a triangular lot in the center of the largest city served by its lines, this being the only feasible site. The engineers who designed the installation were accordingly hard-pressed to locate the oil switches and 13,200-volt busbars on the floor above the operating room, but the problem was solved as shown in the accompanying photograph by placing the switches in a narrow corridor between the outside wall of the building and the wall of the transformer room. Pipe framing run between the walls supports the insulators on which the incoming line is run; the oil switches are

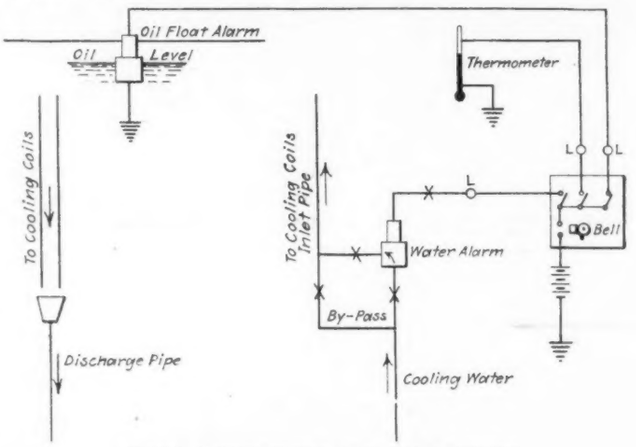


INSTALLATION OF OIL SWITCHES IN RESTRICTED SPACE

mounted in compartments on the floor protected at each end by thick slabs of concrete, and everything is either housed in or protected by pipe framing against accidental contact by attendants. The space is unusually limited, but the clear-cut arrangement of the wiring and switches renders the installation safer than many larger ones less carefully designed.

## Alarm Connection for Transformers

In the accompanying diagram alarm circuits are shown for detecting any abnormal rise in temperature, failure of cooling-water supply or lowering of oil level, in cases where station transformers are installed at points remote from frequent inspection by the switchboard operator. By




ALARM CONNECTIONS FOR TRANSFORMER

the arrangement illustrated the operator can test his oil, water and temperature without leaving his position.

The water alarm is provided by a compression element inserted in the inlet line so that as long as pressure is on the piping the contact is open. If pressure fails for any reason, the circuit is completed, ringing the alarm bell and lighting an indicator lamp. A generally similar oil-level float alarm is installed at the top of the transformer tank to give warning of lowering of the oil. Here also is placed a thermometer with an electrical contact inserted at the point of maximum allowable temperature rise. If the transformer becomes overheated the thermometer circuit will be completed, also giving an alarm. The switchboard circuits may be arranged to give visible and audible warning automatically, or the attendant may be required to make regular inspections and tests.

## Automatic Protection of Line by Differential Relays

Please describe the principle of operation of the Merz-Price system of relay protection by means of which faulty sections of transmission line are automatically removed from the circuit in case of trouble.

K. G. T.

The Merz-Price system, which originated in England, preferably utilizes a ring scheme of connection between stations and substations and depends for its principle of operation on the fact that the currents entering and leaving a given "clear" section of line will be identical in value. If the current values entering and leaving that section become different owing to the development of a short-circuit or ground, relays are automatically energized, operating the main switches and isolating the section in trouble. This is accomplished through pilot wires paralleling the main conductors and connecting together series transformer secondaries whose developed emfs are opposed and normally balanced as long as the entering and leaving currents are identical. If this balance be destroyed by the occurrence of a fault, the resulting unopposed current in the pilot circuit actuates the relays, which at once open the main switches, cutting the affected section clear of the rest of the system. This scheme of protection has the disadvantage of requiring expensive pilot wires paralleling the main line, although a recent improvement by Messrs. Merz and Price splits each main conductor into two parts, the currents in the respective pairs being balanced against each other through relays to secure similar protection.

# Digest of Current Electrical Literature

## Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

### Generators, Motors and Transformers

*Commutation Theory*—K. PICHELMAYER.—A theoretical note with reference to Menges' recent article on the theory of commutation. The present writer endeavors to show that Menges' "neutral zone" cannot possibly be neutral.—*Elek. u. Masch.* (Vienna), Aug. 17, 1913.

*General Transformers.*—F. NIETHAMMER AND E. SIEGEL.—An English translation in abstract of their German paper on the ratio of transformation in the general transformer with distributed windings (trapezium-triangle transformer, etc.). It is shown, both theoretically and experimentally, that in transformers with the primary and secondary windings differently distributed, and with consequently different magnetic interlinkage of the main flux with the two windings, the pressures and current are not in simple relation to the number of turns. Formulas are then given for calculating the ratio of transformation from the distribution of the windings. These formulas are simplified for the case of the induction motor and are confirmed by experiment.—London *Electrician*, Aug. 15, 1913.

*Commutation.*—A. MAUDUIT.—A long account of an experimental investigation with respect to the theory of commutation. When a commutator segment passes below a brush the resulting variation in the distribution of the current in the armature circuits causes a modification of the field produced by the armature. This modification is necessarily periodic and its period is equal to the duration of the passage of a commutator segment. There is a sort of balancing of the field of the armature on the one side and the neutral line on the other and emfs are thereby reduced in the section short-circuited by the brush. The author has investigated this matter with three different types of dynamos and gives a series of interesting oscillograms. The phenomena in question are far more regular in slotted armatures than in smooth armatures. Ring armatures give rise to supplementary non-symmetric deformations. These displacements of the armature field flux modify considerably the value of the emf in the short-circuited coils and render illusory any theory of commutation which does not take this fact into account.—*La Revue Elec.*, July 18 and Aug. 1, 1913.

### Lamps and Lighting

*Arc Lamp.*—P. HOEGNER.—An illustrated article on the Dia arc lamp, which is an inclosed arc lamp with flaming-arc carbons, held one above the other. A double globe is used with a small interval of air. The inner globe is thereby maintained always at a high temperature so that no deposits of salts from the combustion of the carbons will form on the inside of it. Any deposit occurs in the upper part of the lamp, which can be easily cleaned. The life of the carbons is 55 hours for direct-current and 120 hours for alternating current. The direct-current lamp is built for 42 volts, the alternating-current lamp for 39 volts. Data are given which enable the calculation of street illumination by these lamps.—*Elek. Zeit.*, Aug. 21, 1913.

*Tungsten Filaments.*—A note on a recent British patent (No. 6952, 1913) of G. Lüdecke and Brimsdown Lamp Works. With the object of carbonizing, decarbonizing and forming filaments from the raw state in one operation, a cylinder of metallic tungsten or molybdenum is provided within the heated zone of a furnace, as described in specification No. 8996, 1911. Rods of tungsten or molybdenum are arranged in the form of a cage and serve to conduct the heating current. The cage is placed in a furnace shaft of copper or nickel, and the filaments to be treated are introduced into the cage through the top of this shaft, which may then be closed. Provision is made for the expansion of the cage by providing a mercury contact at its base. The furnace is water-cooled.—London *Elec. Eng'ing*, Aug. 21, 1913.

### Generation, Transmission and Distribution

*Oscillations in Direct-Current Networks.*—G. SEIBT.—In direct-current networks which are fed from rotating machinery weak alternating currents flow continually. These currents are due to the phenomena at the commutators of the machines. In the course of some experiments which were made for other purposes the author determined the frequency of these oscillations. The arrangement is shown in Fig. 1. The connections of the network are shown by + and —, $W$ being a resistance and $D$ a choking coil. The current in this circuit acted on a resonance circuit formed by a standard of self-inductance $S_1$ and the condensers $C_1$

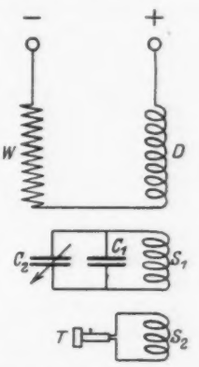



FIG. 1—ARRANGEMENT OF NETWORK FOR DETERMINING FREQUENCY OF OSCILLATIONS

and $C_2$. $C_1$ was a condenser the capacity of which could be changed step by step, and $C_2$ was a condenser with a continuously adjustable capacity. From the constants of the circuit the frequencies corresponding to the resonance conditions can be figured by Thomson's formula. By means of the telephone $T$ in a third loosely coupled circuit $S_2$ the condition of resonance could be determined. It was first found that the network showed no oscillations of a higher frequency than 4400. Other sharp resonance maxima, besides 4400, were found at frequencies of 2400, 1820, 1200 and 910. The last two frequencies gave in the telephone very loud and pure musical sounds.—*Elek. Zeit.*, Aug. 21, 1913.

*Large Electrical Mine Hoist.*—A note on what is held to be the largest electrically operated mine hoist in the world. It is in course of erection at the Crown Mines in South Africa. This company is equipping its shaft with a 4000-hp hoist which will operate on the mains of the Victoria Falls Power Company without any attempt at equalization of the maximum and minimum power demand. With a hoist of this description the motors will require some-

thing like 7000 hp during acceleration, resulting in a load of 9000 hp on the transmission line. The electrical equipment, which has been built by the General Electric Company of this country, consists of two 2000-hp direct-current motors, one being connected at either end of the drum shaft of the hoist itself. The drums which the motors will drive are the cylindro-conical type, the smaller diameter being 12 ft. and the larger 20 ft. 8 in. The speed of the drum is 52.5 r.p.m. The voltage at which the direct-current motors operate is 500 volts, the motors running in series and being controlled on the Ward-Leonard system. These hoist motors will receive their power from a motor-generator set converting the 50-cycle, three-phase energy to direct-current energy. The motor-generator consists of a 5000-hp, three-phase induction motor, operating on the 50-cycle, 2000-volt circuit at 375 r.p.m. It is directly coupled to two separately excited direct-current generators, each rated at 1650 kw. These generators are connected in series and have compensating and commutating field windings to prevent sparking. In order to supply the necessary current for exciting the fields of the two hoist motors and the two generators a 60-kw shunt-wound exciter is provided. The total weight of the motor-generator set will be 138,000 lb., while the total weight of each hoist motor will be approximately 142,000 lb., exclusive of shafting and bearings. This mammoth electric hoist is only one of a hundred or more electric hoists operating on the lines of the Victoria Falls Power Company.—London *Electrician*, Aug. 8, 1913.

### Traction

*Great Britain.*—A. J. LAWSON.—The conclusion of his statistical article in which an analysis is given of the financial position of the tramways of the United Kingdom, the items examined being capital expenditure, cost of construction and equipment, traffic, revenue, appropriations, aid from rates, relief of rates and costs. The average total working costs of all the tramways in the kingdom amounted to 13.248 cents per car-mile run, and, by a coincidence, the average of all the tramways in the London district came to 13.252 cents per car-mile, those of the London County Council tramways being 13.532 cents per car-mile. Actual costs of less than 11 cents per car-mile have been obtained in seven cases, though in one or two of them permanent way and car repairs do not seem to have been adequately provided, and the very lowest traffic expenses appear to be due to the payment of too low a rate of wages to men engaged in rather exacting employment. Eleven cents per car-mile may, therefore, be regarded as the absolute minimum under ordinary conditions which can be obtained in undertakings of moderate size, with 11.5 cents as a general average. For economy, therefore, as well as for comfort and safety, the tramway can not only hold its own but under proper management must prevail against the motor omnibus, whose minimum working costs at the present time, when the vehicles are new and the heavier charges for repairs, maintenance and depreciation are only beginning to accrue, already reach 15 cents per bus-mile on roads as well paved as the London streets.—London *Electrician*, Aug. 15, 1913.

*Electric Traction in Italy.*—A fully illustrated description of the new direct-current locomotives in use in the Milan district of the Italian State Railways, where the direct-current system at 650 volts with a third-rail is in use.—*La Revue Elec.*, Aug. 15, 1913.

### Installations, Systems and Appliances

*Electrostatic Valve.*—O. STEELS.—An illustrated description of the construction and applications of the author's "electrostatic valve," which acts as an insulator as long as the emf impressed on its terminals is below a certain value, which may be as small as 10 volts. If the voltage increases above the predetermined value, the valve permits the current to pass. As shown in Fig. 2, the valve consists of a glass tube $A$ hermetically closed at its ends by means of two fixed pieces $C_1$ and $C_2$, within which the electrodes $B_1$ and $B_2$ are movable so as to permit adjustment of the distances of their spherical ends from each other. Within the center of these electrodes screws $B_1'$ and $B_2'$ are inserted, ending in points. The distance of these two points from each other can also be adjusted. In order to regulate this valve so that it operates at a certain voltage, the arrangement shown in Fig. 3

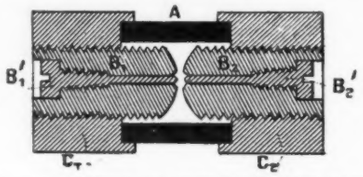



FIG. 2—SECTION OF ELECTROSTATIC VALVE

is used. $C$ is the valve, $A$ and $B$ are lamps, $R$ is a rheostat. The two spherical electrodes $B_1$ and $B_2$ are brought together so as to make contact with each other and are then removed from each other by means of a screwdriver, until the lamp $B$ is extinguished and the lamp $A$ lights up. The same operation is then repeated with the points of the screws $B_1'$ and $B_2'$. For instance, if the valve is to operate at 350 volts, the voltage $U$ is made equal to 50 volts, or if the voltage to operate is 110 volts, $U$ is made equal to

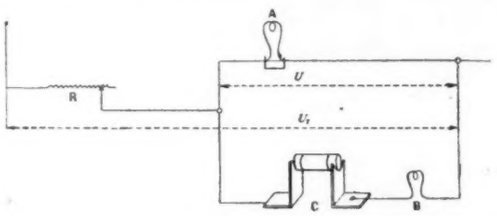



FIG. 3—ARRANGEMENT FOR REGULATING VALVE

10 volts. The author briefly discusses the scientific principles on which the instrument is based and some of its applications as for the protection of telephone lines. In order to diminish the chances of an accidental short-circuit a thin piece of cigarette paper is inserted between the electrodes.—*La Revue Elec.*, Aug. 1, 1913.

### Wires, Wiring and Conduits

*Electrolytic Lightning Arresters.*—G. C. DILL.—An illustrated article on the construction, installation and performance of electrolytic lightning arresters.—*Elec. Journal*, August, 1913.

*Circuit-Breakers.*—J. N. MAHONEY.—An illustrated article describing some recent developments in oil circuit-breakers and several new types.—*Elec. Journal*, Aug. 19, 1913.

### Electrophysics and Magnetism

*Gamma Rays from Radium D and Radium E.*—E. RUTHERFORD AND H. RICHARDSON.—Radium D emits two types of gamma radiation for which $\mu = 45$ and 0.99 $(cm)^{-1}$ in aluminum. Relatively to radium D, radium E emits a very weak gamma radiation, and not more than 2 per cent of the gamma radiation given out by radium D + E in equilibrium is to be ascribed to radium E. In other words, the transformation of each atom of radium D is accompanied, on the average, by fifty times the amount of gamma radiation from an atom of radium E. The soft type of radiation $\mu = 45$ from radium D, and radium E is slightly less penetrating than the corresponding radiation from radium B. There appears to be little doubt that this radiation corresponds to the characteristic radiation of the L type to be expected from an element of atomic weight 210.—*Philos. Magazine*, August, 1913.

### Electrochemistry and Batteries

*Electric Furnaces.*—WOOLSEY MCA. JOHNSON AND GEORGE N. SIEGER.—The first article of a serial on electric fur-

naces, their design, characteristics and commercial applications. The serial is intended for students, engineers and business men. In the first article the general principles of electric furnaces, their design and economics, are given. The chief points brought out are as follows: Electric heat is expensive and can be used only where its efficiency is great. Electric heat can be employed in certain work where it is needed badly. If intelligently studied and applied, electric furnacing will become of large industrial importance and the existing limits pushed to extremes not now thought possible. If an electric furnace be thought of as a short-circuit under control, we must strive to put it under good and intelligent control.—*Metall. and Chem. Eng'ing*, September, 1913.

### Units, Measurements and Instruments

*Electric Method for Measuring the Gradient of Slopes.*—B. AUDRAN.—At the recent exhibition of the French Physical Society in Paris the "inclinometer" of Abraham was shown. This is an electrical apparatus for measuring the gradient of a slope in mines, etc. The transmitter (Fig. 4), which is placed on the slope the gradient of which is to be measured, is a small transformer, the secondary of which is

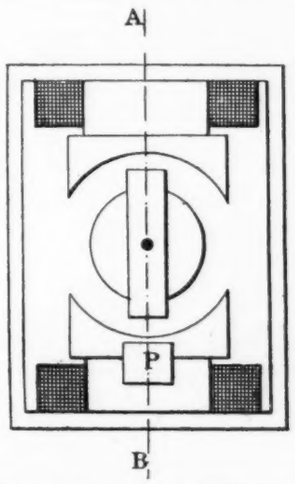



FIG. 4—TRANSMITTER USED IN APPARATUS FOR MEASURING GRADIENT IN MINES

a coil movable around a horizontal axle and maintained in a vertical position by means of the weight $P$. What is desired to measure is the angle between the axle $AB$ of the primary coils and the vertical plane of the secondary coil. The primary coils are wound on cores as shown and the magnetic circuit is closed through the frame of the apparatus. The primary is supplied with alternating current from any source. The flux produced by this current through the secondary depends on the angle $a$ of the sec-

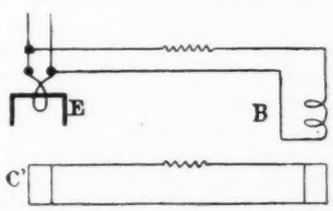



FIG. 5—RECEIVER USED IN APPARATUS FOR MEASURING GRADIENT IN MINES

ondary with $AB$, so that the ratio of the induced emf $U'$ to the impressed emf $U$ is $U'/U = f(a)$. The receiver (Fig. 5) has the appearance of a voltmeter and consists of an alternating-current electromagnet $E$ which is supplied from the same source of emf as the primary of the transmitter-transformer, the impressed emf being also the same. The field of the electromagnet acts on a coil which is thereby displaced. It is not subjected to any directive action of springs, but is connected by two thin silver ribbons with a secondary of the transmitter-transformer. These ribbons do not exercise any appreciable mechanical action. The electromagnet induces in the secondary coil an emf $U''$ which depends on the angle $d$ between them, so that $U''/U = F(d)$. The coil is in equilibrium when the current in it is zero; that is, the emf in the movable coil of the receiver and in the secondary of the transformer-transmitter must be equal and opposite. We, therefore, get $U'' = U$, $F(d) = f(a)$, or the angle $a$ is a function of $d$. The apparatus may be calibrated directly in degrees of gradient. —*La Lumière Elec.*, July 26, 1913.

### Miscellaneous

*Gaseous Explosions Caused by Electric Heating of Bitumen in Cable Troughs.*—W. M. THORNTON AND J. A. SMYTHE.—A case of explosion through the accidental heating of bitumen in cable troughs led the authors to investigate the action of heat upon bitumen. Heat was applied under four different conditions and the resulting gases were examined. The conclusion is reached that bitumen gas, however produced, lies between marsh gas and coal gas in its inflammability.—London *Electrician*, Aug. 22, 1913.

# Book Reviews

REGULATIONS GOVERNING RADIO-COMMUNICATION. Bureau of Navigation, Department of Commerce. Edition of July 1, 1913. Washington: Government Printing Office. 15 pages. Gratis.

This pamphlet contains the regulations under which radio stations and operators are licensed by the Department of Commerce, in pursuance of the act of Aug. 13, 1912. The extent of each of the nine administrative districts having radio inspectors is given, and clear statements are made as to the classification of radio stations according to the services they perform. In a similar way there are set forth the requirements for each of the several grades of operator's license. The circular should be studied by persons contemplating erection of any radio plant.

HANDBOOK FOR WIRELESS TELEGRAPH OPERATORS WORKING INSTALLATIONS LICENSED BY HIS MAJESTY'S POSTMASTER-GENERAL. British Post Office. Revised edition. London, England: Eyre & Spottiswoode. 80 pages. Purchasable from Wyman & Sons, London. Price, 3d.

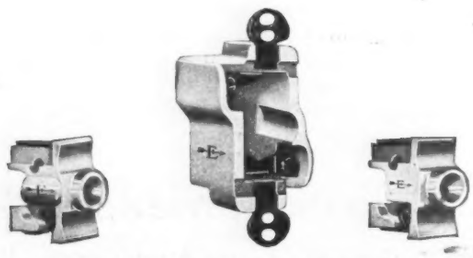
This book is intended to provide a guide whereby operators at ship and coastal radio stations may carry on their traffic according to the international radiotelegraph convention of London, 1912. The six divisions cover the following: Introductory and general comments; form and acceptance of radiograms; special supplementary services; methods of charging, keeping accounts and making reimbursements; procedure to be observed in transmission, and a complete copy of the service regulations annexed to the international convention of 1912. There are also six appendices, giving the international Morse code, standard list of service abbreviations, etc. Although the book is directed to British radio stations, its interpretation of the convention regulations (which are effective in the United States also) recommends it to radio operators in this country. A curious discrepancy is that the internationl abbreviation "QST" is given as meaning "I have received the general call," whereas in the copies of the London convention circulated by the United States Department of Commerce the meaning is stated to be "General call to all stations," American practice, therefore, involves two general calls, namely: "QST" and "CQ." Since "CQ" is accepted internationally as a general inquiry call, the British translation of "QST" would seem preferable.

# New Apparatus and Appliances

**An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers**

## Combination Flush Receptacle

The Arrow Electric Company, Hartford, Conn., is manufacturing a combination flush receptacle which may be used interchangeably with standard plugs and has the added advantage of being adapted for use with a "polarity" plug. The receptacle is grooved so that the polarity plug may be inserted in one position only, but at the same time

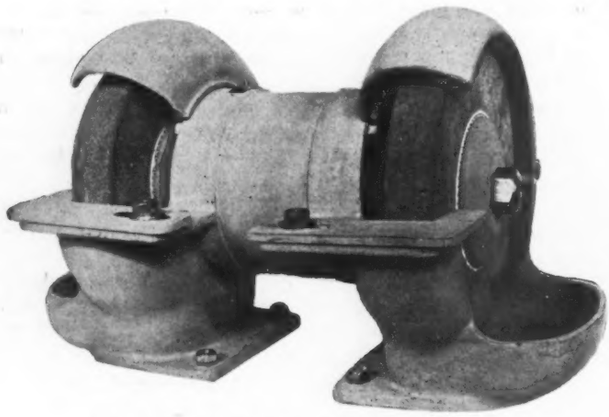


FLUSH RECEPTACLE AND POLARITY PLUG

the groove does not interfere with the insertion of the standard plug in either position. This polarity feature is said to be of advantage in the use of electrically driven machines and in other cases where a fixed polarity is necessary. It is stated that this receptacle is adapted for use with more than 300 types of outlet boxes and fittings now on the market.

## Double-Disk Grinder with Wheel Guards

In the motor-driven grinder shown in the accompanying illustration the frame of the induction motor is extended to form a water basin and support for the adjustable tool rest. The guard over the top half of the wheels is made of a separate piece so that it can be removed if desired. The bearings, which are of the heavy ball-bearing type, are rated at 1600 lb. and are protected from grit off the wheels by



DOUBLE-DISK GRINDER, WITH WHEEL GUARDS

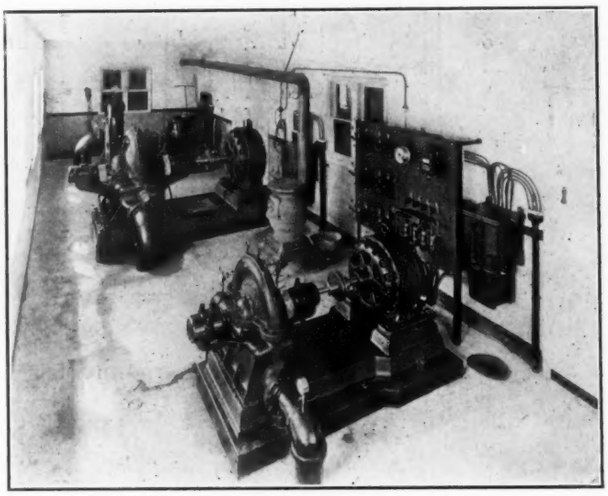
tight-fitting covers. The wheels shown in this illustration are 12 in. in diameter by 2 in. wide, but it is stated that the grinder may be equipped with other wheels.

This grinder is the product of Forbes & Myers, electrical manufacturers, of 172 Union Street, Worcester, Mass.

## Electrically Operated Pumping Station

The 8,000,000 gal. of water used daily in the city of Utica, N. Y., is obtained from two natural watersheds, one north and the other south of the city. From these points the water is conducted through 20-in. mains and by direct intake to three reservoirs known as the Pleasant Street station. The three reservoirs are designated as Nos. 5, 2 and 4 and are located above the city 218 ft., 200 ft. and 254 ft. respectively. Their capacities are 200,000,000 gal., 40,000,000 gal. and 284,000,000 gal. By drawing water from reservoir No. 5 only, the heads provided by the northern and southern supplies "balance" very closely so that a uniform city pressure is obtained.

In order to take advantage of this condition, an electrically operated plant was installed to pump the water from reservoirs Nos. 2 and 5. The equipment consists of three motor-driven centrifugal pumps, shown in the accompanying illustration. The most distant pump in the picture is a 10-in., single-stage, single-side suction pump, having a



PUMPING STATION AT UTICA, N. Y.

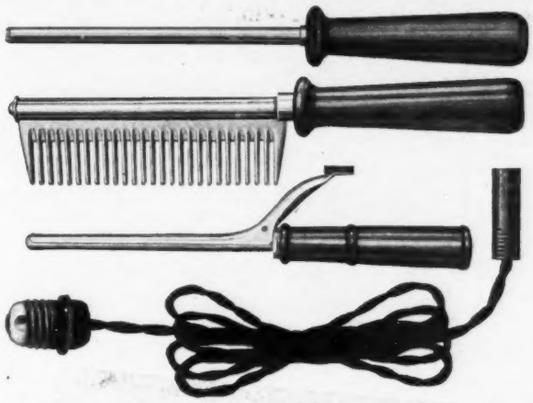
rating of 3500 gal. per minute against a 60-ft. head. This pump is driven by a 100-hp induction motor operating at 690 r.p.m. The middle unit is a 10-in., 3500-gal., single-stage, double-suction centrifugal pump directly connected to a 75-hp induction motor. The third pump is a 5-in. single-stage, double-suction centrifugal unit rated at 700 gal. per minute at 150-ft. head. This pump is directly driven by a 50-hp induction motor. The motors operate on a two-phase, 60-cycle, 220-volt circuit of the Utica Gas & Electric Company.

The piping is so arranged that the two 10-in. pumps can be used to take water from either of the two lower reservoirs and discharge it into the higher one, or they can be used as booster pumps discharging directly into the city mains.

The plant was designed by Mr. A. B. Tracey, engineer in charge of the water-works. The pumps were furnished by the Goulds Manufacturing Company, Seneca Falls, New York, and the motors by the Westinghouse and Crocker-Wheeler companies.

## Combination of Electric Waver and Hair Drier

A combination set which includes an electric waver, a curling iron and a hair drier, the three having a total demand of 110 watts, is being manufactured by the William E. Slaughter Company, of Chicago. Each of the devices



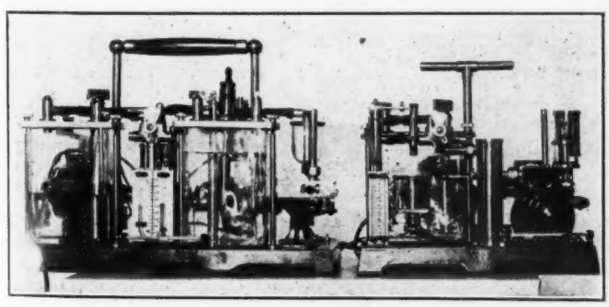
COMBINED ELECTRIC WAVER, CURLING IRON AND HAIR DRIER

is small and very light, being made of aluminum, a material heretofore considered unsuitable for such use. The heating units in the waver and curler each consume 22 watts and that in the comb hair drier takes about 65 watts.

The heating unit consists of a central steel rod surrounded with an insulating compound on which is wound a spiral of resistor wire. The entire unit is then covered with a special compound which prevents oxidation of the wire. Connection is made to the element by means of a plug having a tip and sleeve similar to a telephone jack. The plug and cord furnished with the outfit can be used interchangeably with any one of the devices. An advantage of this type of connection is that the waver or curling iron can be rotated in the hand without twisting the cord, the motion aiding to insure a perfect contact. A twisting, pulling motion is required to remove the plug. The handles of the devices are made of wood which has been baked at a temperature of 340 deg. Fahr. and coated with a rubberoid enamel which will stand 300 deg. Fahr.

## Producing Anesthesia Electrically

The accompanying illustration shows a new application for small motors in connection with a machine for producing anesthesia. The apparatus used consists of a fractional horse-power motor driving a small air compressor, a glass chamber containing ether and another containing



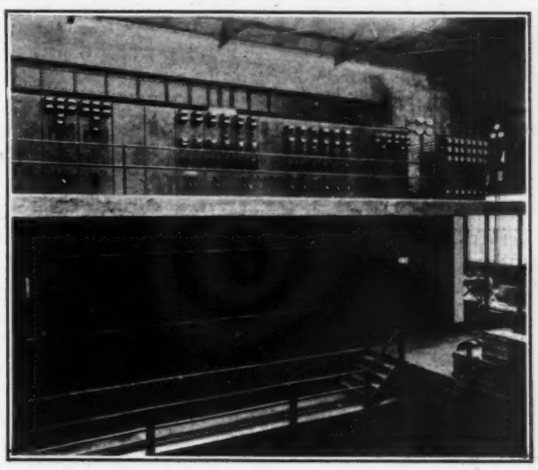
APPARATUS USED FOR THE PURPOSE OF PRODUCING ANESTHESIA ELECTRICALLY

water, together with a filter for purifying the air. A series of valves and connections direct the flow of the air and ether vapor, and a condensing chamber frees the etherized vapor of moisture while a slide-valve permits the functions of respiration.

Compressed air passes from the purifying chamber through the ether, and the vapor is then carried to the water chamber, where it is heated, at the same time joining air which had previously been diverted. The water is warmed by an electric heater attached to the switch on the motor. From the water chamber the vapor goes through the condenser and then through a long tube to the patient's lungs. The pressure which is indicated by a manometer may be regulated from zero to 88 mm of mercury. A safety valve on the pipe affords protection against excessive pressure. Another valve permits the anesthetist to control the vapor, increasing or decreasing the ether strength or administering warmed air toward the end of the operation. The motor shown in the illustration was made by the Diehl Manufacturing Company, Elizabeth, N. J.

## Improved Insulating Material

An insulating material recently put on the market by the H. W. Johns-Manville-Company, New York City, is being utilized by central stations in places where it was formerly considered good practice to use marble, slate or wood. In the accompanying photograph is shown a portion of the new water-power development at Elkhart, Ind., in which



DOORS AT ELKHART (IND.) PLANT

this material known as "asbestos wood," was extensively employed. The three-panel doors, measuring 4 ft. 11.25 in. by 2 ft. 7.75 in., are made of this material. The top row is equipped with a lower panel of wire and inserted glass to facilitate the inspection of the high-tension apparatus without removing the doors.

This type of insulating material has also been used in the construction of the horizontal and vertical barriers separating the high-tension switches, high-tension busbars and the lightning arresters in the tower of the plant.

The material itself is a composition of asbestos fibers and a binding cement which has been subjected to high hydraulic pressure and a patented curing treatment. It is said that the material will take on a high polish and may be machined and worked in much the same manner as is done where wood is used.

## Electric Vehicle for Milk Delivery

The Detroit Creamery Company recently purchased a 1-ton commercial electric truck for the route through the Grosse Pointe district, which is 11 miles from Detroit. A special body was devised for milk delivery service. The sills and side-risers are protected with copper and the windows are plate glass. The interior is equipped with

dome lamps to aid drivers and night workmen. The lettering is gold-leaf pencil varnish and is placed upon a white background. The wheelbase of this car is 84 in., the tread is 58 in. and the tires are 32 in. by 3 in. in front and 34 in. by 3.5 in. in the rear. The speed is 12 miles per hour, and the mileage radius is 55 miles loaded.

ELECTRIC VEHICLE FOR MILK DELIVERY

The vehicle was made by the Anderson Electric Car Company and is furnished with an equipment of sixty cells of Edison storage batteries.

## Improved Portable Testing Set

A portable testing set for measuring conductor and insulation resistance has recently been brought out by the Thompson-Levering Company, of Philadelphia, Pa. The instrument is a modified form of circular slide-wire bridge

PORTABLE TESTING SET

made in such a manner as to give a large number of steps, making it equivalent to a very long slide wire. The system of moving parts has been made as light in weight as possible so that shocks and jars will not as readily injure the sapphire-jeweled bearings. For the convenience of the tester a battery switch has been added to the instrument which allows the use of the middle finger and thumb for turning the resistance dial indicator, while the index finger of the same hand is used for tapping the battery key at will. This leaves the other hand of the tester free for other purposes. Another switch has been added to the equipment, which simplifies the connections that have to be made for the Murray and the Varley loop tests. This switch combines all of the connections for these tests so that turning the button to the name of the test desired renders the bridge ready for the test.

All metal parts of the instrument are of brass and the case is of solid oak. The mounting plate is made of hard rubber.

## Electric Dumb-Waiters

The art of electric dumb waiter construction has shared—if, indeed, not gone ahead of—recent refinements in elevator design and operation, until now electric dumb-waiters are available for all purposes and special applications, be-

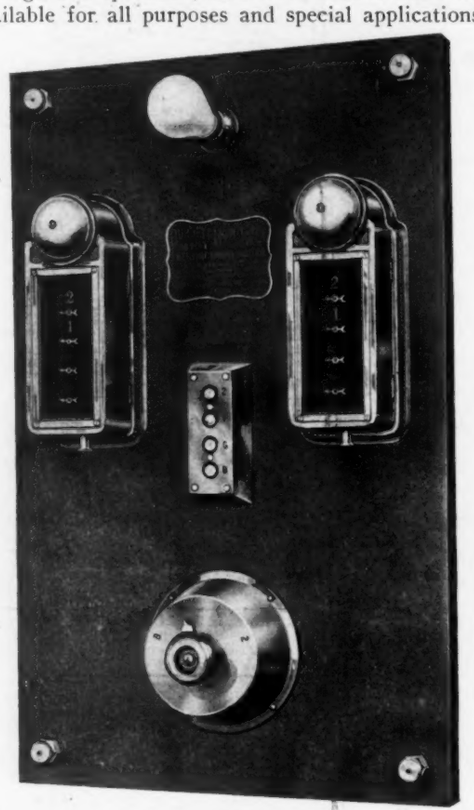


FIG. I—OPERATING BOARD FOR ONE-POINT CONTROL

coming conveniences that are really practical necessities about well-equipped hotels, clubs, apartment houses, restaurants, libraries and factories.

There are two general methods of control available for such dumb-waiter manipulation, the selection depending upon the particular purposes for which the system is to be used. In the "car-control" system the car itself is equipped with a full set of push-buttons, one for each floor, by means of which it can be dispatched to any floor desired. The car will not start, of course, until the door has been closed. Approaching the floor for which it was designated, the car automatically slows up, finally coming to a full stop at the proper position and lighting a signal lamp to give notice of its presence. If some one on another floor wishes to summon the car, he has only to press a button located at the side of his shaft-door, and if the dumb-waiter is unengaged, as shown by the door being closed, the car will come at once to the calling floor. No door can be opened until the car is in position. Limit switches prevent over-travel at top and bottom of the shaft, and a slack-cable switch immediately

GRIPPER AND SIDE GUIDE

applies the brake and safety devices in case of breaking of the supporting cable. The driving mechanism is equipped with a spring brake held free by an electromagnet in series with the motor, so that the brake is automatically applied when the motor stops.

The other system is known as the one-point control, the movement of the car being effected from a centralized control station on one of the floors where an attendant is always present. This operator may, of course, have other duties besides that of operating the dumb-waiters. This system applies especially where a group of dumb-waiters is to be controlled. Such a control station is shown in the accompanying illustration. Indicators show the source of calls for the car, and others report when the car has reached its destination and whither it is next ordered. A signal lamp indicates whether the car is idle or in use and whether any door is open. The bank of signal buttons for dispatching the car is installed in the car itself. They connect with annunciators at the control station, apprising the attendant there who actually governs the car's movement. Alarm bells also connect with each floor so that the operator can sound a warning in case a door is carelessly left open or the car is unnecessarily detained.

Electric dumb-waiters are now in operation running at speeds of 1000 ft. per minute. With the automatic stops used,

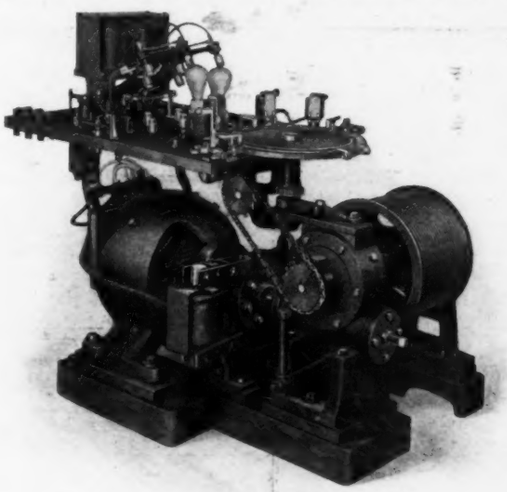


FIG. 2—OPERATING MECHANISM FOR PUSH-BUTTON CONTROL

the cars are always brought within an inch or so of the floor positions, regardless of loads carried. These loads may range from 150 lb. to 700 lb., low speeds of 50 ft. per minute being recommended for the heavier loads. Amplifying the systems above described, a number of modifications of automatic and push-button control can be introduced to meet particular conditions. Each machine is designed especially for the conditions of load, speed, travel and voltage of the intended installation. The equipment described is built by the Burdett-Rowntree Manufacturing Company, Chicago and New York.

## Indirect Lighting in Substation

The new 187th Street substation of the United Electric Light & Power Company in New York City, recently placed in operation, has been equipped for indirect illumination, with a provision for direct emergency lighting.

A night photograph of the control-board balcony, where indirect lighting is used exclusively, is shown in Fig. 1. The meter dials are brightly lighted without the customary glare and reflection from their glass covers, which in certain positions makes it extremely difficult to read the instruments. The balcony itself is 13 ft. high, 82 ft. long and 8.5 ft. wide in front of the board. Eight outlets, using a total of 1200 watts, give a specific consumption of 1.72 watts per square foot for this area. The lighting fixtures are suspended at a distance of 30 in. from the white ceiling.

Fig. 2 is a view of the main transformer and rotary room, where the ceiling is 31 ft. high, the room being 89 ft. wide by 265 ft. long. The indirect lighting used in this

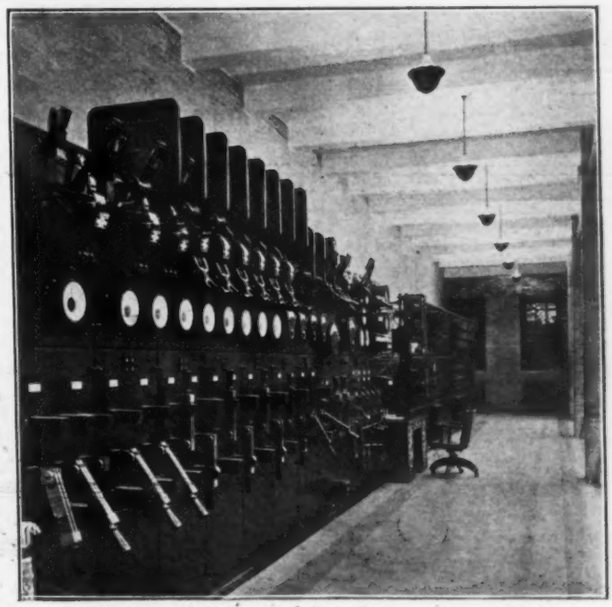


FIG. 1—INDIRECT LIGHTING IN SWITCHBOARD ROOM

room practically all the time is furnished from five fixtures each carrying lamps with a total rating of 500 watts. The power consumption in this room is 1.06 watts per square foot. The tops of the reflectors are 42 in. below the ceiling. The auxiliary lighting system consists of twenty 100-watt lamps each equipped with a reflector. These units

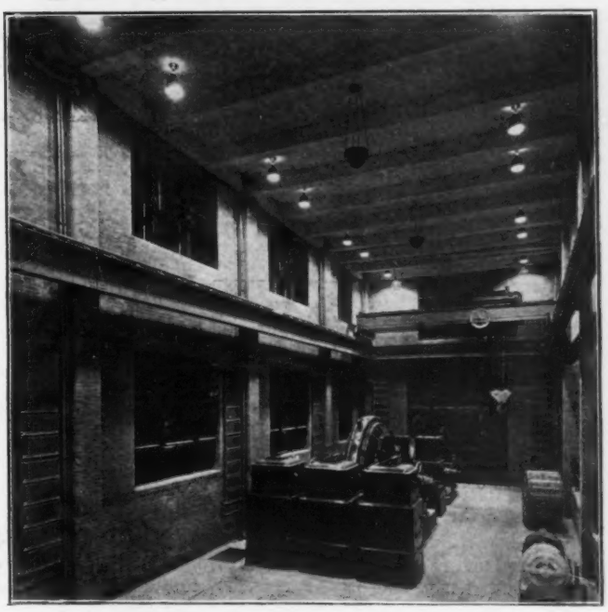


FIG. 2—AUXILIARY LIGHTING UNITS IN OPERATION

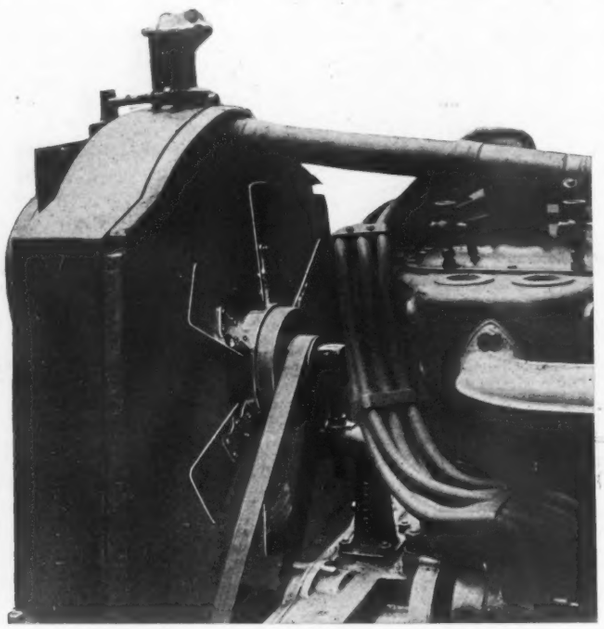
consume a total of 2000 watts, or 0.85 watt per square foot. The picture of the transformer room was taken with the emergency lamps in operation while the indirect units were not lighted.

The fixtures for both systems were furnished by the National X-Ray Reflector Company, Chicago, Ill.

GRIPPER AND SIDE GUIDE

## Generator for Automobile Lighting System

A belt-driven electric generator which may be installed on old models of automobiles such as those which came out before the days of electric starting and ignition is shown in the accompanying illustrations. The generator is hermetically sealed to prevent damage from water and dirt. The armature revolves outside the field coils so that no matter what speed the engine may attain no trouble can arise due to centrifugal stresses on the windings. The brushes are made of round pieces of carbon and are inclosed. Of the charging characteristics of the fan generator it is said that low speed gives a high rate of charge while the rate drops off as the speed of the engine increases. The claim is made by the manufacturers that the placing of the generator in



AUTOMOBILE LIGHTING SYSTEM GENERATOR

the center of the fan actually increases the fan's efficiency since it prevents the air from being drawn back through the center of the fan as it is sent in toward the engine by the ends of the fan blades.

This so-called "fan-type generator" is being made by the Kouyoumjian Electric & Manufacturing Company, of Cleveland, Ohio.

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## Electricity for Office Appliances

Evidence of the strides which manufacturers are making toward replacing manual and mental operations by electrically operated machinery was shown by the number of motor-driven office labor-saving devices on exhibition at the business show held in Chicago on Sept. 8 to 13. Probably the most recent application of electricity there shown was a system of master, program and time-switch clocks which operate on 110-volt energy. These clocks wind and synchronize every five minutes, storing up enough energy each time to operate the clocks two hours and a half in case the energy should fail at any time. The time-switch attachments are made in sizes large enough to make and break 400 amp, obviating what has heretofore been one of the drawbacks where a simple mechanism is desired. This line of appliances was exhibited by the Baird Equipment Company, Chicago.

An electrically operated rapid calculator was displayed by the Ensign Manufacturing Company, Chicago. It has the novel feature of automatically shutting off its motor when not needed. While operating normally the motor does not run all of the time, as enough energy is stored in a spring to accomplish seven operations, after which the motor again starts.

Machines which accomplish the act of sealing, stamping and counting envelopes in one operation were exhibited by the Mail-om-eter Company, Detroit. Similar machines which accomplish the results separately were exhibited by the American Multigraph Sales Company, Cleveland, and by Saunders & Company, Kansas City. A device for opening letters was shown by the Lightning Letter Opener Company, Rochester, N. Y. This machine is capable of turning out 200 letters per minute. Letter folders were also on exhibition at the booth of the American Multigraph Sales Company.

Extensive displays were made by the National Cash Register Company of Dayton, Ohio, showing various types of electrically operated cash registers and credit telephone systems. An electrically operated display which attracted considerable attention in this booth represented the different outlets for money collected by a business enterprise. It consisted of a table on which were three open money bags labeled "Overhead," "New Stock" and "Profit." Supported above the table was a revolving display sign which enumerated the different outlets for money and gave the percentage of the gross income which goes toward the maintenance of different branches of a business. In synchronism with the different displays shown on this sign, coins would appear at the edge of the table and travel across it, propelled by the agency of concealed magnets, finally disappearing in the open mouths of the money bags which lay on the table. In addition to the exhibition of manufactured products, this company conducted a free "kinemacolor" moving-picture show which was of an educational value along the lines of manufacture and use of the company's products.

Dictating machines were on exhibition at the booths of Thomas A. Edison, Inc., Orange, N. J., and the Columbia Graphophone Company. The device manufactured by the latter company has several improvements, chief among which are the use of a new hand-control operated by direct spring wire and a ventilating fan on the operating motor, which cools the resistance, preventing the drying up of the lubricating oil on the mechanism. The Edison company is using a sanitary flexible steel speaking tube and a double collapsible mandrel which avoids breakage of cylinders when being put on.

Seven electric vehicles were displayed by the Argo Electric Vehicle Company, Saginaw, Mich., four of which were passenger cars.

An interesting booth was that of the General Acoustic Company of New York, where the practicability of the dictagraph for intercommunicating conference features was demonstrated. In this booth an intercommunicating dictagraph was substituted for the ordinary telephone, conversation being carried on in low tones with telephone operators located in different parts of the building. With the speaker 10 ft. away from the dictagraph the operator at the other end of the line could plainly hear figures spoken in low tones. An electric fan was humming in the room, showing the non-interfering quality of the set.

Tabulating machines having electrically driven adding and subtracting attachments were exhibited by the Underwood Typewriter Company. These machines have a varied application, being fitted to do billing, statement writing, cross and column footing, ledger entries where totals are desired, and many forms of statistical work.

Other electrically equipped office appliances were exhibited by the Adder Machine Company, Wilkes-Barre, Pa.; Addressograph Company, Chicago; Burroughs Adding Machine Company, Detroit; Moon-Hopkins Billing Machine Company, St. Louis, and the Lisenby Manufacturing Company, Fresno, Cal.

# Industrial and Financial News

## Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

**Semi-Indirect Fixture with Pull Socket Control.**—There is to be put out shortly by the Electrical Engineering Company, of Minneapolis, Minn., a 100-watt pendent semi-indirect fixture which it has recently developed and which it claims is different from anything so far seen in that a pull socket control is used with it.

**Milwaukee Concern Busy.**—The electrical work on the new Christian Science Church at Milwaukee, Wis., has been awarded to the Herman Andrae Electrical Company, of that city, which reports that it has also secured the contract for wiring the Industrial Chemical Institution at the same place. This company is now wiring a number of the post offices in different sections of the country.

**New Lighting Fixture Brought Out.**—The Elgin Motor Company, of Elgin, Ill., is marketing a new type of lighting fixture, called by it the "deflectolier," and it claims for this device a brisk sale both in this country and abroad. This apparatus consists of an inverted conical diffuser with openings at its center and around its sides from which a cluster of incandescent lamps may be hung. The New York office of the company, at 31 Barclay Street, is in charge of A. E. Goetz.

**Castings Produced from Wrought-Iron Stock.**—The Hess Steel Castings Company, of Philadelphia, Pa., has recently perfected a process for the production of castings from the purest wrought-iron stock. It is claimed by the company that this material produces castings of the greatest possible ductility, density and uniformity, which are particularly adapted for use in parts of electromagnetic equipment where high permeability is desired, and for use in service where high pressures or temperatures or excessive corrosion is encountered.

**Large Electric Excavator.**—A Lidgerwood-Crawford electric excavator of unusual size is under construction by the Lidgerwood Manufacturing Company under the supervision of Mr. G. M. Crawford, of Chicago. This machine will have a boom 100 ft. long and will be equipped with a bucket capable of holding 4 cu. yd. of earth. It will be operated by alternating-current 440-volt, 60-cycle, three-phase motors and has been ordered by Mr. D. C. Stevens, contractor, for 8,500,000 cu. yd. of excavation and levee building near Cape Girardeau, Mo. Energy will be purchased from an electric-service company for the operation of this large machine.

**Pacific Coast Appliance Manufacturer Busy.**—The Berkeley Electric Cooker Company, of Berkeley, Cal., reports a rapidly increasing demand for its automatic electric cooker. Orders are being received from European and Asiatic countries, South America, South Africa and Australia, in addition to a large volume of domestic sales. To accommodate the business the factory has been enlarged and now occupies the entire three-story reinforced-concrete building at 1932 Center Street, with offices on the second floor. A number of auxiliary cooking appliances are being developed and will shortly be placed on the market.

**Alliance Cranes for the Bethlehem Steel Plant.**—The crane equipment supplied by the Alliance Machine Company, of Alliance, Ohio, for the new Lehigh plant of the Bethlehem Steel Company, which was mentioned in the Sept. 6 issue of the *Electrical World*, consists of five 5-ton, ten 10-ton, two 15-ton, one 40-ton, one 60-ton and one 100-ton crane. This apparatus is of mill-type all-steel construction and is all equipped with dynamic braking, except in the cases of the last two machines, which are four-girder, ladle cranes of the latest type, provided with magnetic brakes. The crane switchboards are all equipped with Youngstown safety limit stops on the hoisting motors.

**Conditions on the Pacific Coast.**—A recent letter from San Francisco, Cal., indicates that conditions in the electrical and allied industries along the Pacific Coast are fairly quiet at the present time. Some difficulty is being experienced in certain quarters, it is understood, in the marketing of municipal bonds, and this has held up to some extent building operations in the localities affected. The statement is also made that many of the electric companies are having the same difficulty in disposing of their securities and that their construction work has been handicapped by this fact. However, there is apparently a feeling that these conditions are not permanent and that there will shortly be a picking up in all lines.

**Another Wireless-Station Contract Let.**—The J. G. White Engineering Corporation has obtained the contract for the construction of another wireless telegraph aerial at the station now being built at Oahu, Sandwich Islands. This addition to the equipment at that station will enable communication to be established between it and the stations in the Philippine Islands, and is a decided step in the globe-circling system of wireless communication planned by the Marconi Wireless Telegraph Company. It is expected that by the first of the year the above station will be able to communicate with the California station, also under construction now, and that early in 1914 Asiatic communication will be established. The J. G. White Engineering Corporation is doing all of this construction work.

**Sign-Selling Campaign Inaugurated.**—The Thomas Cusack Company, of Chicago, Ill., is placing before central-station managers an attractive offer in connection with the booming of the electric sign as an advertising medium. This company designs, builds, equips and maintains electric signs of all kinds and supplements this service by a campaign of mail and newspaper publicity which the individual station is not, as a rule, prepared to furnish. In return for its assistance in pushing this very profitable kind of business in its locality, the company proposes to lend to the central station the use of this organized publicity service. An attempt is to be made in this way to create an increased demand throughout the country for electric roof signs of the larger sizes.

**Locating a Broken Water Main.**—A new and interesting application of the "Telefault," manufactured by W. N. Matthews & Brother, of St. Louis, Mo., was explained in a recent letter to that concern from J. T. Greene, of the Department of Public Safety, Toledo, Ohio. Mr. Greene states that some time ago a large boat, dragging anchor, broke one of the heavy water mains that cross under the Maumee River. This main being buried, the divers were unable to locate it. When the water main was laid a large submarine cable was installed in the same trench by the Western Union Telegraph Company, and this cable was undisturbed by the anchor so that telegraph service was not interrupted. A circuit was devised using vacant wires in the cable, and by means of the "Telefault" this circuit was located, thus disclosing the location of the water main, and allowing repairs to be made.

**Reasons for the Stability of Public Utilities.**—"Publicity and absolute frankness in dealing with the public," said Paul Leake, publicity representative of the United Light & Railways Company, of Grand Rapids, Mich., "have come to be recognized as an advantageous necessity by public utility corporations and industrial companies. Well-managed public utility corporations are not only willing to give to the public full information as to their operations and earnings, but they court investigation as to these details. One reason for this attitude is that the showing is usually of such a nature as to inspire confidence in those

who have money to invest. In spite of political uncertainty and general timidity exhibited by capital, the securities of public utilities, especially those of gas and electrical companies, remain remarkably firm. That the general public realizes the stability of public utility securities is shown by the fact that to-day there is scarcely a large banking house in the East that does not carry a line of these securities in its investments."

**Copper-Coated Steel Sheets Offered.**—In anticipation of a pronounced rise in the price of copper within the next few months Herman Boker & Company, of 101 Duane Street, New York, have prepared a reserve stock and are ready to furnish samples or fill orders for their line of copper-covered steel-sheet metal, which is applicable for automobile parts, roofing service and other purposes where there is little waste of the metal. The copper is welded to the steel ingot in preparing this product and the whole passed through the rolls and forced out in the sheet form. The process is one which the company claims to have used for over twenty-five years. The standard thickness of copper is 20 per cent of the entire thickness of the sheet on both sides of the steel, making a total copper thickness of 10 per cent.

**Exterior Theater Illumination.**—At the opening of the Century Opera House, Sixty-second Street and Central Park West, New York, this week, a unique exterior illumination scheme was displayed. There had been formerly no adequate illumination of the exits along Central Park West and the means used for correcting this defect were both novel and attractive. These exits are designd with a prominent keystone arch effect and at the top of this stone there was bolted a short upright Corinthian column, from which two drooping arms extended. A single flaming-arc lamp was hung from each of these arms. There was a cluster similar to the above at each of the five exits, and the total effect with the lamps in operation was very pleasing. The ornamental metal fixtures for this installation were supplied by the J. L. Mott Iron Works and the flaming-arc lamps by the H. M. Hirschberg Company, both located in New York City.

**Large Turbo-generators for the Philadelphia Electric Company.**—Supplementing a note in the Aug. 9 issue of the *Electrical World*, the General Electric Company has given out further information on the big generating sets recently ordered by the Philadelphia Electric Company. The latter company has ordered two horizontal turbines, of 30,000-kw and 35,000-kw capacity respectively, each set consisting of a single turbine driving a generator of similar capacity. The smaller turbine will run at 1500 r.p.m. and will be directly coupled to a 25-cycle generator mounted on the same bedplate. A 60-cycle generator will be driven at 1200 r.p.m. by the larger turbine. With the exception of a similar 30,000-kw machine which the General Electric Company is building for the Commonwealth Edison Company, of Chicago, these turbines are considerably larger than any other single generating set heretofore contracted for in this country or abroad.

**Frost Warnings by Telephone.**—Many kinds of agricultural products, and in particular fruit, are very liable to severe injury from sudden frosts, even of short duration. To guard against the spoiling of its crops in this manner the Wood River Orchard Company, which owns extensive fruit orchards near Weiser, Idaho, has installed a novel system for giving frost warnings by telephone. Dial-type thermometers are located north, east, south and west of the orchard area and fitted with fixed and adjustable contacts which are arranged to close local circuits whenever the temperature drops to a certain predetermined point. This gives the signal at the main office of the company, indicating not only the fact that a frost is imminent but also from which direction it is coming. Following this signal the several orchard men in the affected district are immediately notified by telephone, allowing them time to start fire in the smudge pots with which light or medium frosts can be successfully combated.

**Lockport (Ill.) Has Trouble in Getting Electricity.**—Lockport, a city on the Chicago Drainage Canal, was without electricity on the night of Sept. 8. It has been obtaining energy from the Sanitary District of Chicago and is said to be behind about $5,000 in its payments to the municipal corporation. A contract that had been in existence for about seven years expired on Jan. 20 last, and the Sanitary District gave the city notice that it would not renew and would shut off the supply of electricity on Sept. 1. This time was extended for a week by courtesy. The Sanitary District says that all its available energy is now needed for Chicago and furthermore intimates that the city of Lockport has not proved to be a prompt-paying customer. The municipality has been purchasing energy from the District for 0.5 cent per kw-hr., it is said, and retailing it to about 175 local consumers, all of whom are now without electricity. The Public Service Corporation of Northern Illinois has offered to supply energy, but at a higher rate. It is reported that a promoter has offered the city a bonus of $15,000 if allowed to furnish energy at 13 cents a kw-hr. This plan is opposed by the merchants, but is said to be favored by the Mayor.

**Motor Drive Supplied for Textile Mills.**—Among the textile mills which have recenty obtained motor equipment for drive purposes from the Westinghouse Electric & Manufacturing Company are the Pine Tree Silk Company, of Philadelphia, Pa., the Penn Tapestry Company, Glen Riddle, Pa., and the Cedar Cliffs Mills, Chambersburg, Pa. The Stroock Plush Company, of Newburgh, N. Y., has added a 400-kw engine-type generator to its power equipment, as well as 350 hp in motor equipment, part of which will be used as individual drive for its plush looms. Improvements which have been in progress in the plant of W. E. Hooper & Sons Company, Baltimore, Md., are practically completed and electric drive has been installed throughout. Energy is being supplied by the Consolidated Gas, Electric Light & Power Company, and the electrical installation is said to be one of the finest in Baltimore. One hundred and fifty motors, aggregating 2000 hp, are used. An addition of 300 looms has been made at the plant of the Rosemary Manufacturing Company, Roanoke Rapids, N. C., and individual drive will be used on these machines, as well as on the spinning frame and the pickers. At the same plant 300 hp in motor equipment is to be installed for driving line shafting.

**Lake Spaulding Development Nearing Completion.**—Vice-president John A. Britton, of the Pacific Gas & Electric Company, recently issued a statement to stockholders in denial of a report that the company had temporarily suspended operations on its hydroelectric development at Lake Spaulding. He wrote in part as follows: "Reports from our engineers show that greater progress was made on the Lake Spaulding dam in the last month than during any previous period in the history of its construction. This dam will be 365 ft. high and will impound in Lake Spaulding about 30,000,000,000 gal. of water. Concrete is being poured on the dam at the rate of 2000 cu. yd. a day, and it is now 150 ft. above bed-rock, with 75,000 cu. yd. of concrete already in place. By Nov. 1 the dam will be high enough to enable us to make use of it for our power plant below. The tunnel, a mile in length, leading from the dam through the rock into Bear Valley was completed May 1. Since that time trimming has been going on, and this tunnel with a diameter of 9.5 ft. is now ready for use. The canal which takes the water from the tunnel to the new power house in Bear River Gorge is to be 8.5 miles long, and a section of this 40,000 ft. in length has been completed. Three steam shovels are averaging 1000 cu. yd. a day on its excavation, and it is expected that it will be completed by Nov. 1. The reservoir which will be used as a forebay at the power house is to be 13 acres in extent and is now 85 per cent completed. From this reservoir the water will drop 1375 ft. to the power house. Most of the 72-in. steel pipe which will convey the water from the reservoir to the turbines is now on the ground and over 70 ft. of this pipe is being put in position each day. The high-tension transmission line, 114 miles long, from the power house to the distributing station at Cordelia is being rapidly completed. Of the 735 steel towers which will carry this line 400 have already been erected, while the remainder are at their foundations awaiting erection. The wires have been strung over a portion of the distance, and the entire line should be completed and ready to operate by October. Work on the big substation at Cordelia is progressing rapidly, and everything will be in readiness there by the time that the power house begins to deliver energy, early in November."

# Corporate and Financial

**Stone & Webster Securities Company Report.**—The Railway & Light Securities Company, an investing company formed by the Stone & Webster interests, has made a report for the fiscal year ended July 31, 1913. The total earnings for the year, including dividends received and interest received and accrued, were $274,868; interest paid and accrued amounted to $85,680; taxes were $3,992 and expenses were $8,758, leaving a profit from income of $176,438. Profits were also obtained by the purchase and sale of securities. Dividends of 6 per cent were paid on the preferred and common stock. The surplus was $70,467. The total surplus at the close of the fiscal year was $471,004.

**Mississippi River Power Company Stock Listed in Boston.**—The balance sheet as of June 30, 1913, shows that property, plant and contracts stand at $40,337,936; payments for additional construction at $1,399,134; interest during construction at $697,708, and cash at $65,222. On the liabilities side there are: Common stock, $16,000,000; preferred stock, $6,000,000; first mortgage bonds, $18,000,000, and notes payable, $2,500,000. Of the total stock outstanding $4,000,000 preferred and $15,999,500 common were paid for by the property, rights and franchises of the Keokuk & Hamilton Water Power Company and by the construction of the plant and the acquisition of land and other property in connection therewith; cash was paid for $2,000,000 preferred and $500 common stock.

**Development of Kanes Falls Company.**—An issue of first mortgage bonds of the Kanes Falls Electric Company, of Glens Falls, N. Y., is offered for sale by Ashley & Company, of New York, at 92½ and interest. The bonds are part of an authorized issue of $500,000, of which $178,000 are outstanding. They are dated 1905 and are due on June 27, 1955, but are redeemable at the option of the company at 105 on any interest date, or at 100 at the option of the holder on or after Aug. 1, 1923. The company is building a new power station and a 14-mile transmission system with steel towers from Kanes Falls to Granville, N. Y., and adjoining quarries. It has operated for four years a hydroelectric plant near Fort Ann, N. Y., with a transmission line extending 13 miles to Glens Falls, N. Y. It also owns another water-power at West Fort Ann, which is to be developed. The power in Glens Falls is sold to the Adirondack Electric Power Corporation under a long-term contract. Service is furnished in Fort Ann. A contract has been made with the Granville Electric & Gas Company guaranteeing the Kanes Falls company a minimum of $8,760 per year for a certain number of kilowatt-hours daily. The Granville extension will reach the slate district of Rutland County, Vt. In this district and the neighboring one in Washington County, N. Y., there are fifty-eight operators, nearly all of whom now make slate by hand.

**Progress of the American Public Utilities Company.**—The report of the board of directors of the American Public Utilities Company for the year ended June 30, 1913, mentions some of the physical improvements that have been made in the properties of the subsidiary operating companies, some of which are electrical companies. The Utah Gas & Coke Company of Salt Lake City, Utah, has discontinued an isolated electric generating plant and is now purchasing power from the Utah Light & Railway Company, thus effecting a very decided reduction in power cost. The overhead system of the electric department of the Jackson Light & Traction Company of Jackson, Miss., has been improved and strengthened. At the Edison station of the La Crosse Gas & Electric Company, La Crosse, Wis., additional boilers are being installed to take care of the heating business of the company and the heating station equipment is being overhauled generally. The business in Indianapolis has grown rapidly during the past year. The demand upon the two power houses of the Merchants' Public Utilities Company has developed to such an extent that it has become necessary to install additional boilers. It has also been deemed advisable to install a water-softening plant. The equipment at one plant is being entirely rehabilitated. The plant of the People's Light & Heat Company, of Indianapolis, is now being operated in connection with the plant of the Merchants' company, and considerable saving in operating cost has been effected. The electrical distribution system of the People's company is being improved and strengthened. The report says that while a great deal of attention has been given to the organization of the company and to the physical condition of its properties, the commercial possibilities have not been overlooked. At each one of the plants modern methods for securing new business have been employed, with marked success in every instance.

**Boston Edison Company's Operations.**—The return of the Edison Electric Illuminating Company, of Boston, Mass., which has just been filed with the Gas and Electric Light Commission for the year ended June 30, 1913, shows a total income of $6,365,874, compared with $5,787,345 for 1912, and total expenses of $3,558,721, compared with $3,195,718 a year ago. The company now has 52,447 customers in Boston and the thirty-eight suburban municipalities which it serves, compared with 43,246 in 1912, and its total energy output at the switchboard was 171,783,312 kw-hr. as against 150,987,350 kw-hr. in 1912. Its receipts from the sale of energy for commercial lighting were $4,248,441 in 1913, compared with $3,883,679 in 1912, and its sales for industrial purposes totaled $1,257,612, compared with $1,112,277 in the preceding year. The cost of manufacture for 1913 was $1,118,422, and for 1912 $920,136. During the fiscal year the company declared dividends of 12 per cent on the par value of its stock, amounting to $1,950,333. During the fiscal year 1913 the company used 167,097 tons of coal at an average cost of $3.80 per ton. In 1912 its fuel consumption was 141,668 tons, costing $3.56 per ton. The maximum station load was 60,143 kw, occurring Dec. 18, 1912, the previous year's maximum being 55,114 kw. The company sold 118,023,078 kw-hr., compared with 102,930,250 kw-hr. in 1912. The total connected load on June 30, 1913, was 175,146 kw, as against 153,583 kw last year. The company now supplies 2963 kw in municipal arc lamps, 4658 kw in commercial arc lamps, 819 kw in municipal incandescents, 97,825 kw in commercial incandescent-lighting service and 69,881 kw in motors. It has 8465 customers using energy for motors, etc., and 43,472 customers using only incandescent lighting service. During the year it gained 1002 customers on its motor circuits. The generating plants of the company have a total rating of 101,400 kw, of which 90,000 kw is the rating of the main station at L Street, South Boston, in the form of three-phase, 60-cycle units, 1000 kw is in three-phase generators at Waltham and 10,400 kw in direct-current machines at the Atlantic Avenue station, Boston. Two 12,000-kw and two 15,000-kw turbo-alternators are now included in the company's equipment. The company employs 1475 persons, compared with 1311 last year, there being 108 in the generating department, steam division, 175 in the generating department, electrical division, 503 in the distribution department, 461 in offices and the supply department, 101 on the construction force, 68 in the transportation department, 40 in the laboratory and 19 in the steam-heating department.

## NEW YORK METAL MARKET PRICES

| | Sept. 9 Bid. | Sept. 9 Asked. | Sept. 15 Bid. | Sept. 15 Asked. |
|---|---|---|---|---|
| Copper: | | | | |
| Standard, spot* | 15.50 | 16.37½ | .... | 17.00 |
| | Selling Prices | | Selling Prices | |
| | £ s d | | £ s d | |
| London, standard, spot* | 73 5 0 | | 74 15 0 | |
| Prime Lake | 16.75 | to 16.87½ | 16.75 | to 16.87½ |
| Electrolytic | 16.60 | to 16.70 | 16.62½ | to 16.75 |
| Casting | 16.40 | to 16.50 | 16.37½ | to 16.62½ |
| Copper wire base | 17.75 | to 18.00 | 17.75 | to 18.00 |
| Lead | 4.75 | | 4.75 | |
| Nickel | 40.00 | to 45.00 | 40.00 | to 45.00 |
| Sheet zinc, f. o. b. smelter | 8.00 | | 8.00 | |
| Spelter, spot | .... | 5.90 | 5.85 | to 5.90 |
| Tin, spot* | 42.40 | to 42.75 | 42.75 | to 43.00 |
| Aluminum: | | | | |
| Prompt delivery | 21.50 | to 22.50 | 21.50 | to 22.50 |
| Future | 20.00 | to 21.00 | 20.00 | to 21.00 |

## *OLD METALS

| | | |
|---|---|---|
| Heavy copper and wire | 14.75 | 14.75 |
| Brass, heavy | 9.25 | 9.25 |
| Brass, light | 8.25 | 8.25 |
| Lead, heavy | 4.65 | 4.65 |
| Zinc, scrap | 4.75 | 4.75 |

## *COPPER EXPORTS

Total tons to Sept. 15 ..... 13,052

*From daily transactions on the New York Metal Exchange.

## Business Notes

**The Reynolds Electric Flasher Manufacturing Company,** of Chicago and New York, has recently added to its traveling staff S. B. Johnson and W. B. Blair.

**The Best Pipe Engineering & Supply Company** has been organized by George Best, former president of the Best Engineering Company, and his son G. H. Best, and the offices of the new company are located at 3026 Liberty Avenue, Pittsburgh, Pa. The concern will manufacture and install high-pressure piping valves and fittings for various services.

**The Adams-Bagnall Electric Company, of Cleveland, Ohio,** has appointed R. G. Kittle district sales manager, with headquarters at 40 Wall Street, New York. Mr. Kittle succeeds G. A. Thomson and will have charge of sales in this territory for the regular line of electrical equipment put out by the company, as well as its new line of automobile accessories.

**The Mechanical Appliance Company.**—H. A. Barrett, formerly of the Electric Appliance Company and also of the Jenney Electric Company, has been appointed manager of the Chicago office of the Mechanical Appliance Company of Milwaukee, succeeding J. A. Adamson, resigned. This office has been moved from the Fisher Building to the Webster Building.

**The H. W. Johns-Manville Company, of New York,** has opened an office and warehouse in Galveston, Tex., to supplement its present branches at Houston and Dallas. Galveston, because of its location and shipping facilities, makes an ideal distributing center, and in the large brick warehouse there will be accumulated the stock for distribution to the firm's Texas territory. It is planned to receive at that point heavy shipments by coastwise lines from New York. Another fact that makes Galveston a convenient distributing point is the company's increasing trade with Central and South America.

**The Beck Electrical Construction Kompany** has been formed in Minneapolis, Minn., with V. S. Beck at the head. Mr. Beck has held various positions with several of the Stone & Webster companies in the Middle West, most recently being associated with the Mississippi River Power Company at Keokuk, Ia. The new company will do a general engineering contracting business, making a specialty of electric power plant and transmission-line work. It will also act as manufacturers' agents and has already secured the agency for several engineering concerns. The offices will be in the Andrus Building.

## New Industrial Companies

**The National Insulator Company,** of Pittsburgh, Pa., has been granted a charter with a capital stock of $5,000. The company will deal in insulators. The incorporators are: George A. Young, Andrew Hill, Jr., and William P. Welker.

**The Wayman-Aiken Electric & Manufacturing Company,** of Pittsburgh, Pa., has been incorporated with a capital stock of $6,000 by T. A. Wayman, G. A. Aiken and G. E. Wayman. The company proposes to manufacture gas engines, etc.

**The Pittsburgh Electric Tool Company,** of Pittsburgh, Pa., has been incorporated by Max Harris, Harry S. Stewart and M. K. Garrett. The company is capitalized at $5,000 and proposes to deal in electrical appliances and machinery of all kinds.

**The Masterphone Corporation of Manhattan** has been incorporated with a capital stock of $20,000 to manufacture talking machines. The incorporators are Matthew B. Smith, Walter J. Burchett and A. Parker Smith, 2 Rector Street, New York, N. Y.

**The Albert Goldstein Engineering Company,** of New York, N. Y., has been incorporated by Morris Greenblatt, William F. McCord and Isadore Newman, of 1522 Vyse Avenue, New York. The company is capitalized at $10,000 and proposes to manufacture and deal in electrical appliances.

## Trade Publications

**Electrical Supplies.**—The Illinois Electric Company has issued a price list and discount sheet applying to Catalog 19 on electrical supplies.

**Deflectoliers.**—Edward J. O'Beirne & Co., of Elgin, Ill., are distributing a small fourteen-page pamphlet describing their combination lighting diffusion and its various applications.

**Lighting Glassware.**—In order to call attention to its new showrooms at 71 West Twenty-third Street, New York, the Gleason-Tiebout Glass Company has issued an attractive four-page booklet on semi-direct glassware.

**Switches.**—Descriptive Leaflet No. 3551 issued by the Westinghouse Electric & Manufacturing Company fully describes and illustrates type F alternating-current magnetic switches. These switches are designed to withstand the severest forms of industrial service.

**Wires and Cables.**—The Simplex Wire & Cable Company, 201 Devonshire Street, Boston, has issued a price list of its Simcore wires and cables, which are made in accordance with the rules and requirements of the National Board of Fire Underwriters effective January, 1912.

**Insulators.**—Catalog No. 3 recently issued by the Pittsburgh High Voltage Insulator Company, Derry, Pa., contains a few general notes on the subject of its insulators, accompanied by working drawings of its comprehensive line of style and sizes. The catalog contains 160 pages, and is well printed on soft-toned paper inclosed in a dignified cover.

**Automobile Lamp.**—The Aiken revolving automobile lamp is briefly described and illustrated in a leaflet issued by the Herrick Aiken Company, Inc., Bay State Building, Lawrence, Mass. This lamp is easily adjusted on any make of car and is run by a battery or a generator. The revolving characteristic of the lamp is of special value to the automobilist.

**Outdoor Substations.**—The Transmission Engineering Company, Pittsburgh, Pa., has recently issued a folder in which are set forth the advantages of the outdoor substation, where dairies, factories and small towns near transmission lines are desirous of purchasing energy. Brief construction data and the estimated cost and income from these stations are given.

**Motors.**—"Selecting Motor Equipment for Electrically Operated Hoists" is the title of a bulletin (Section 3113) issued by the industrial and power department of the Westinghouse Electric & Manufacturing Company. This pamphlet gives interesting information on the subject of hoisting equipment, including a number of formulas and a diagram of connections of different systems.

**Mining Machine.**—A twenty-four-page illustrated bulletin, No. 118, has recently been issued by the Jeffrey Manufacturing Company, Columbus, Ohio, entitled "The Care and Operation of Jeffrey 28A Shortwall Mining Machine." This machine is used for cutting coal. Full details of construction and operation are given, and a number of good illustrations of the manner of handling the apparatus are shown.

**Automobiles.**—The Anderson Electric Car Company, Detroit, Mich., in its advance bulletin states that its 1914 line will be exceptionally comprehensive. Within the twelve pages of the bulletin six new models are shown, accompanied by descriptions and prices. Reference is also made to a new feature, the Detroit Duplex drive, by the use of which it is possible to drive the car either from the front or from the rear seat.

**Signs.**—The United States Sign Company, Gadsden, Ala., has issued a catalog describing its convex reflector illumination sign. It illustrates and gives specifications of some recent original and novel designs which the company has installed in various Southern cities. This illuminating sign is said to be an improvement upon the old studded-lamp arrangement by subduing the light through the reflector process so as to eliminate its blurring effect. It retains its attractiveness in the daytime and can be animated by the use of flashers at night. The sign is made entirely of metal and is said to weigh less and to cost less initially than other signs.

# Personal Mention

**Mr. W. T. Drew** has been appointed manager of the newly instituted electric-light plant at Titusville, Fla.

**Mr. G. H. Briggs** has been appointed superintendent of the Thornapple Gas & Electric Company, Hastings, Mich.

**Mr. J. W. Worthington,** of Sheffield, Ala., has been elected vice-president of the Alabama Power Company, of Talladega, Ala.

**Mr. L. S. Frantz** has recently been appointed superintendent of the municipal electric light and water works of Friend, Neb.

**Mr. R. H. Taliferro** has been appointed secretary and treasurer of the Appalachian Power Company, of Bluefield, W. Va.

**Mr. F. L. Annable** has been appointed general superintendent of the Pacific Electric Railway Company in Southern California.

**Mr. Charles F. Barnes** has been appointed acting manager of the London (Ont.) Electric Company, succeeding Mr. E. I. Jenking.

**Mr. J. C. Cornelius,** formerly superintendent of the Perry (Okla.) lighting plant, has joined the electrtical staff of Swift & Company, Chicago.

**Mr. L. A. Webb** is secretary and treasurer of the Central Power Company, of Pe Ell, Wash., recently acquired by the Central Light & Manufacturing Company.

**Mr. O. B. Niesen** has resigned as local manager of the Eastern Light & Power Company, of Claremont, N. H., and will be succeeded by Mr. R. W. Berliner, of New York.

**Mr. J. P. Brown,** superintendent of the Nashville (Tenn.) Railway & Light Company, has been elected president of the newly organized Jovian luncheon club of Nashville.

**Mr. Theodore N. Vail,** president of the American Telegraph & Telephone Company, has been elected a member of the executive committee of the New York, New Haven & Hartford Railroad.

**Mr. E. T. Cope** has resigned as instructor in the mechanical-engineering department of the University of Michigan, Ann Arbor, to join the staff of the Edison Electric Illuminating Company, of Detroit.

**Mr. Stanley Eisenhoffer,** formerly of the Toronto (Ont.) Hydro-Electric System office staff, has been appointed superintendent of the underground system of the hydro-electric department of the city of Hamilton, Ont.

**Mr. Joseph F. Lewis,** assistant professor of electrical engineering in Lafyette College, Easton, Pa., recently passed the civil-service examination for electrical engineer in the department of city transit, Philadelphia, Pa.

**Mr. F. B. H. Paine,** general manager of the Niagara, Lockport & Ontario Power Company, which purchases energy in bulk from the Ontario Power Company of Niagara Falls, Ont., and distributes it in New York State as far east as Syracuse, has severed his connection with the company.

**Mr. James E. Weaver,** who has served as superintendent for the Alabama Power Company at Talladega, Ala., for several years, has been transferred to the superintendency of the company's service at Huntsville, Ala. He will have charge of both street-railway and electric-lighting business in that city.

**Mr. K. L. Aitken,** formerly general manager of the Toronto Hydro-Electric System and under whose direction the system was designed, constructed and placed in operation, has returned from Europe and will re-establish his practice as consulting engineer. Temporarily his address will be in care of the Toronto company, 226 Yonge Street, Toronto.

**Mr. H. S. Black** has been appointed manager of works of the Westinghouse Lamp Company, Bloomfield, N. J., to succeed Mr. R. H. Henderson, resigned. Mr. Black has had considerable experience in the engineering and manufacturing departments of the National Quality Lamp Division of the General Electric Company and for the last three years has directed the work of the St. Louis factory of the company.

**Mr. Henry Waterman Peck,** president-elect of the Eastern New York Section, National Electric Light Association, is vice-president and general manager of the Schenectady (N. Y.) Illuminating Company. Mr. Peck is a graduate of Yale and took post-graduate work at Cornell. His first electrical experience was with the Westinghouse interests at Pittsburgh, but after four years he joined the staff of the Consolidated Gas & Electric Company of Baltimore, Md., as electrical engineer. Later he was appointed assistant electrical engineer of the Rochester (N. Y.) Railway & Light Company, having risen to the position of assistant general manager at the time he was appointed general manager of the Schenectady company. Mr. Peck is a fellow of the American Institute of Electrical Engineers.

**Mr. Harry L. Monroe,** whose appointment as district manager of the Chicago office of the General Electric Company has just been announced, has spent his entire business life with that company and its predecessor and is widely known among electrical men throughout the country. He was born in Parkersburg, W. Va., and removed to Chicago when hardly more than a boy, entering the employment of the Thomson-Houston Electric Company in September, 1888. Mr. S. A. Barton was then in charge of the Chicago office of the "T-H" company, and young Monroe was employed in the shipping and stock department, of which he was put in charge after about three months' service. In 1892 the Thomson-Houston company was consolidated with the Edison General Electric Company, forming the present General Electric Company. Mr. B. E. Sunny was appointed district manager of the new company and Mr. Monroe was made purchasing agent of the Chicago office. In June, 1894, Mr. Monroe was transferred to Texas, becoming manager of the Dallas office of his company. He remained in this position until January, 1905, when he returned to Chicago to succeed Mr. T. P. Bailey as manager of the railway department of the Chicago office. In January, 1913, after the death of Mr. J. W. Johnson, who succeeded Mr. Sunny as district manager of the Chicago office, Mr. Monroe was made district sales manager in Chicago, and his appointment as district manager of the Chicago office dates from Aug. 26 of this year, although it has been but recently announced. Mr. Monroe is a charter member of the Jovian Order, his "potential" being 5. He is also a member of the Union League, Automobile and South Shore Country clubs of Chicago and of the Mohawk Club of Schenectady. He is married and has two children, a daughter of nineteen and a son of seven.

HARRY L. MONROE

# Obituary

**Reuben Clark Winchester,** treasurer of the Holyoke (Mass.) Water Power Company, died at his home in Holyoke on Sept. 11 after a short illness. Mr. Winchester was born in Marlboro, Vt., fifty-six years ago, and after being educated at Holyoke and New York entered the professional baseball field for a short time, where he was highly successful among the earlier players of the national game. In the winters of 1878 and 1879 he was employed by the Holyoke Water Power Company as a collector, becoming permanently attached to the staff in 1880 and passing through the positions of paymaster and cashier to the treasurership, which he attained in 1903. The Holyoke Water Power Company supplies hydroelectric energy to many of the large mills of Holyoke, and Mr. Winchester's broad interests and diplomatic qualifications rendered him a leader in industrial affairs in the upper Connecticut Valley. He is survived by a daughter.

# Construction

## New England

BOSTON, MASS.—The City Council has authorized Commissioner Rourke to secure an estimate from the Edison El. Illg. Co. of Boston for lighting the streets now lighted by gas with electricity. There are now about 1000 gas lamps used in this city.

BOSTON, MASS.—Bids will be received by L. K. Rourke, commissioner of public works, 49 City Hall, Boston, Mass., until Oct. 28 for furnishing and erecting a pumping plant for high-pressure fire service in the proposed underground pumping station in Charles Street, between Beacon and Boylston Streets. Forms of proposals and a set of two plans showing general arrangements and details may be obtained at Room 49, City Hall.

BROOKLINE, MASS.—The Selectmen have granted the Edison El. Illg. Co. of Boston permission to construct and maintain underground conduits on Elba Street and Crowninshield Road, Washington Street and Beacon Street, Rawson Road and Crowninshield Road.

BUZZARDS BAY, MASS.—Plans are being considered to light the entire route of the Cape Cod Canal (8 miles long) with 40-cp tungsten lamps erected in pairs on opposite sides of the canal 100 ft. apart. Two highway bridges and a railroad bridge cross the canal, which are operated by electricity at present supplied by the New Bedford & Onset Ry. Co.

CAMBRIDGE, MASS.—The Cambridge El. Lt. Co. expects to install within the next 30 days an underground distribution system on Massachusetts Avenue from Lafayette Square to Central Square, and to install an incandescent lighting system on Fresh Pond Parkway. W. E. Holmes is treasurer and general manager.

TAUNTON, MASS.—The contract for the new turbo-generator and exciter for the municipal electric-light plant has been awarded to the Allis-Chalmers Co., of Milwaukee, Wis., at $24,000.

ANSONIA, CONN.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Oct. 21 for construction, complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Ansonia, Conn. Drawings and specifications may be obtained at the above office or at the office of the custodian at Ansonia. O. Wenderroth is supervising architect.

WINDSOR LOCKS, CONN.—The Windsor Locks Business Men's Association is planning to install an ornamental lighting system on Main Street (about 1500 ft.); lamp standards will be erected on one side of the street only, about 90 ft. apart. Cast-iron posts carrying two pendent lamps (60-watt tungsten) each are under consideration. The proposed system will be maintained by underground wires. F. J. Bidwell, Jr., is president of the association.

## Middle Atlantic

BROOKLYN, N. Y.—Bids will be received by the Park Board, Department of Parks, Arsenal Building, Fifth Avenue and Sixty-fourth Street, borough of Manhattan, New York, until Sept. 25, for labor and materials required for the erection and completion of the general contract and electrical work for shelter house and comfort station located in Highland Park, borough of Brooklyn. Blank forms and further information may be obtained at the office of Frank J. Helmle, 190 Montague Street, Brooklyn, where plans and specifications may be seen. Charles B. Stover is president of Park Board.

DEPOSIT, N. Y.—The Deposit El. Co. expects to purchase within the next three months one 250-kw, three-phase, 60-cycle, 2300-volt, 200-r.p.m. engine-type generating unit and switchboard for same. The company has recently installed a new street-lighting system in Deposit, consisting of 62 32-cp, ten 200-cp and seven 350-cp tungsten lamps. John D. Mickle is treaurer.

JAMESTOWN, N. Y.—The managers of the municipal electric-light plant expect to purchase within the next six months a 1000-hp turbo-generator with condenser, switchboard panel for above machine and one 75-lamp rectifier outfit with 75-arc lamps. Clayton O. Johnson is superintendent.

NEW ROCHELE, N. Y.—The Council has authorized Mayor Waldorf to enter into a contract with the Westchester Ltg. Co. for installing and maintaining an ornamental street-lighting system on Main Street for a period of three years.

NEW YORK, N. Y.—Bids will be received by the Department of Public Charities, foot of East Twenty-sixth Street, New York, N. Y., until Oct. 6, for furnishing material and installing fire-alarm system, alterations, repairs, etc., in the various buildings under the jurisdiction of the Department of Public Charities of the city of New York. Blank forms and further information may be obtained at the office of A. L. A. Himmelwright, consulting engineer, 50 West Twenty-fourth Street, borough of Manhattan, where plans and specifications may be seen. Michael J. Drummond is commissioner.

ROCHESTER, N. Y.—The committee on lamps and electricity of the City Council has decided to install inverted magnetite-arc lamps erected on concrete standards, similar to those on East Avenue but of lower candle-power, on St. Paul Street from Avenue E to the city line, replacing the old-fashion arc lamps now in use. The residents of Chili Avenue have petitioned the Council for tungsten lamps to replace the present arc lamps on that avenue.

SODUS, N. Y.—The Wayne Pwr. Co., of Sodus, has connected its mains with Avoca, which completes the main line of 20 miles of 11,000-volt transmission system, and furnishes energy for lamps and motors in Atlanta, North Cohocton, Cohocton, Wallace and Avoca. Negotiations are under way toward extending the lines into Bath. Energy will be furnished to the Bath El. & Gas Co. for distribution. The company has a franchise in Naples, to which place extensions will be made in the spring, and will purchase all kinds of construction material and substation equipment for this extension. A proposition has been submitted to the company for Niagara Falls power, which may be accepted later as the lines of the Niagara company are only 20 miles distant from the Wayne company's lines. The Wayne Pwr. Co. is controlled by Mills Brothers, of the Sodus Gas & El. Co. and the Marion Pwr. Co. G. R. Mills is president.

SYRACUSE, N. Y.—Plans have been prepared by Henry C. Allen, city engineer, for establishing an ornamental street-lighting district, covering 3 miles of streets. An ordinance will be presented to the City Council creating the district, and it will provide that the cost be met by assessing one-half to the property-owners and the other half to the city at large. The proposed system will consist of 492 standards carrying five-lamp clusters, of which 277 are to be new, 215 standards now being in use. The Syracuse Ltg. Co., it is said, will begin work on the installation as soon as the district is established and other necessary action taken.

KINGSTON, PA.—The Borough Council has awarded the Luzerne County Gas & El. Co., of Plymouth, a contract for lighting the streets of the borough for a period of seven years. Under the present contract the borough pays $60 per lamp for 74 lamps; the new contract calls for 90 lamps at $50 each per year.

LEBANON, PA.—Contracts have been awarded by the Hershey Chocolate Co. for additions to its power plant which will increase the output by 2250 hp. The company furnishes energy to operate the street railway system of the Hershey Transit Co., which connects Lebanon and Campbelltown.

NORRISTOWN, PA.—Bids will be received by the trustees of the State Hospital for the Insane, Norristown, until Oct. 1 for a 120-r.p.m., 1200-cu. ft. air compressor. Specifications may be seen at the office of Dr. W. A. Drysdale, consulting engineer, 415 Hale Building, Philadelphia.

OIL CITY, PA.—The Citizens' Trac. Co., of Oil City, has nearly completed its reconstruction work and improvements and now has only to finish its power house, where a 1500-kw turbine with two boilers is being installed. It is also changing over steam piping and switchboard work. W. W. Cole is acting general manager.

SIPESVILLE, PA.—A company has been organized by the residents of Sipesville to install and operate an electric-light plant here. Contract for the construction of the plant has been awarded to Fairbanks, Morse & Co., of Cleveland, Ohio. The officers of the company are: Nelson Shaulis, president; Simon Swank, vice-president; Silas Bittner, secretary, and A. E. Friedline, treasurer.

WARREN, PA.—A new power plant, it is reported, will be erected at the Pennsylvania State Hospital for the Insane at Warren, to cost about $125,000.

SUCCASUNNA, N. J.—Steps have been taken to secure a street-lighting system for the most thickly populated sections of Roxbury Township. A resolution to appropriate funds not to exceed $3,000 will be submitted to the voters at the primary election.

TRENTON, N. J.—Bids will be received by the State House Commission at the office of the state comptroller, State House, Trenton, until Sept. 30, for construction and equipment of power plant for the New Jersey State Hospital in accordance with plans and specifications on file in the office of the commissioner of charities and corrections, State House, Trenton. For further information address Joseph P. Byers, commissioner of charities and correction. Edward I. Edwards is secretary of commission.

EASTON, MD.—The City Council has granted a franchise for the construction of an electric-light plant in Easton. The proposed plant will be driven by steam power and will have an output of 275 hp. For further information address William Daunenhauer, 1117 Lincoln Street, Wilmington, Del.

SPRINGFIELD, W. VA.—The Magnolia Pwr. Co. contemplates the construction of a hydroelectric power plant on the south branch of the Potomac River. The present plans provide for developing 13,000 hp at a total cost of $1,000,000. Electricity will be transmitted to Springfield, Romney and other towns in this vicinity. F. Ernest Brackett, of Cumberland, is engineer.

WHEELING, W. VA.—The Wheeling Valley Lt. & Pwr. Co. has been granted a franchise by the County Commissioners to erect transmission lines throughout the Wheeling district to furnish energy for lamps and motors.

LYNCHBURG, VA.—The City Council is considering the installation of an electric-power plant to furnish electricity for street lighting, to cost $138,000, and providing for an auxiliary water supply in case of accident to the gravity system, involving an expenditure of $220,000.

WASHINGTON, D. C.—Bids will be received at the office of the chief signal officer, War Department, Washington, D. C., until Sept. 26, for furnishing 3500 lance poles with combination tip as per specifications 376-B. Bids will also be received until Sept. 23, for furnishing the following supplies: (1) For 1400 lb. friction tape, 4-oz. rolls, ¾ in. wide, in tin boxes, as per specifications 569-B; (2) 600 lb. rubber tape, in 4-oz. rolls, ¾ in. wide, in pasteboard boxes, as per specifications 569-B. Major W. L. Clarke is disbursing officer.

## North Central

BAY CITY, MICH.—The contract for the general construction work of the addition to the water-works building for the new electric-light plant has been awarded to H. G. Beard, for $3,700.

GRAND RAPIDS, MICH.—Plans are being prepared by Wernette, Bradfield & Mead, architects, for the construction of a new power plant, 20 ft. by 40 ft., for the factory of the Stow & Davis Furniture Co., of Grand Rapids. A new 150-hp engine will be installed.

JACKSON, MICH.—Improvements are contemplated by the Commonwealth Pwr. Co. to its local system involving an expenditure of $50,000 during the fall and winter. The plans provide for utilizing energy in Jackson for both commercial and manufacturing purposes; all wires are to be placed underground. Orders have been placed for a 10,000-hp steam generating unit to provide energy for this city in case of accidents to the hydroelectric systems.

PONTIAC, MICH.—The Pontiac Commercial Association, of Pontiac, has appointed a committee to confer with the Pontiac Pwr. Co. relative to the installation of an ornamental lighting-system in the business section of the city.

AKRON, OHIO.—The Ohio Utilities Commission has granted the Northern Ohio Trac. & Lt. Co., of Akron, permission to issue $1,500,000 in bonds, the proceeds of $800,000 to be used for refunding purposes and the remainder to provide for power and railway developments.

BLANCHESTER, OHIO.—Improvements and extensions are contemplated to the municipal electric-light plant in Blanchester.

CAMBRIDGE, OHIO.—The New Midland Pwr. & Trac. Co., of Cambridge, has just completed the installation of a street-lighting system in Byersville, consisting of 44 tungsten lamps of 100 cp on Westinghouse adjuster socket system. C. H. Howell is general manager.

FINDLAY, OHIO.—The Toledo, Bowling Green & Southern Trac. Co., of Findlay, has submitted another proposition to the City Council for street lighting. The company offers to furnish new arc lamps, the minimum number used to be 225, at $55 per lamp per year. In return the company asks that its lighting franchise be extended seven and one-half years.

GREENVILLE, OHIO.—Within the next three months the Greenville El. Lt. & Pwr. Co. expects to erect a 33,000-volt, three-phase transmission line to Union City, a distance of 13 miles, and to purchase one 300-hp water-tube boiler, one switchboard panel for above transmission line, transformers, cross-arms and poles for above line. D. L. Gaskill is president.

MANSFIELD, OHIO.—The city of Mansfield is considering the installation of a municipal electric-light plant, to cost about $100,000. E. A. Blecker is director of public service.

CLOVERPORT, KY.—Preparations are being made by the Cloverport Ice Co. for the installation of an electric-light plant, to cost about $15,000. A. A. Simons is president of the company.

DAWSON SPRINGS, KY.—The New Century Hotel Co., of Dawson Springs, contemplates the installation of an electric-light plant, to cost about $7,500, and would like to receive estimates on same. F. M. Fisher, of Paducah, is president.

GRAYSON SPRINGS, KY.—The Grayson Springs Hotel Co., which proposes to build a hotel and summer resort in Grayson Springs, to cost $450,000, has engaged G. V. Newel, of Chicago, Ill., as architect. The proposed plans provide for a lighting plant.

LOUISVILLE, KY.—At a meeting held recently the stockholders of the National Pwr. Co. elected officers and completed plans for carrying out the project of utilizing the falls of the Ohio River. The headquarters of the company will be moved from Birmingham, Ala., to Louisville. George G. Fetter was elected president.

PINEVILLE, KY.—The Kentucky Utilities Co., of Lexington, has purchased the power plant near Pennington Gap, W. Va., in what is known as the "Pocket Country," and is contemplating the purchase of the plant at Varilla. If the deal is consummated, it will tie in the two plants at Harlan.

ANDREWS, IND.—The property of the Andrews Lt. & Pwr. Co. has been purchased by the Huntington Lt. & Fuel Co., of Huntington. As soon as arrangements can be made energy for operating the local system will be supplied from the Huntington plant and a 24-hour service established. The local plant will be closed down.

GAS CITY, IND.—The managers of the municipal water-works plant expect to install within the next two months two boilers of 150 hp each, 125 lb. working pressure, in the water-works plant; also to purchase within the next two months two motor-driven centrifugal pumps. T. S. McKee is superintendent.

INDIANAPOLIS, IND.—The Stenotype Co. will install a power plant in its new factory now in course of construction. The equipment will consist of two 250-hp Heine boilers, a 400-hp Chandler-Taylor steam engine, a 300-kva, three-phase, 60-cycle Westinghouse generator, one generator panel and two feeder panels (Westinghouse), 900 carbon, tungsten and Buckeye incandescent lamps. Contracts for machinery have been placed. S. J. H. White is engineer in charge of the work.

ELGIN, ILL.—The City Council is considering the question of submitting to the voters the proposition to issue $150,000 in bonds for the construction of a municipal electric-light plant.

GALVA, ILL.—The city of Galva has granted E. D. Brown, of Elmwood, a franchise to construct and operate an electric-lighting system here.

LA SALLE, ILL.—The Board of Supervisors of La Salle County has granted the Citizens' Ltg. Co., of La Salle, a franchise to construct and operate an electric transmission line across the La Salle-Oglesby concrete highway over the Shippingsport bridge and east to the Vermilion River bridge. This line will furnish energy to the Jonesville Mine of the La Salle County Coal Co. and for the illumination of the highway.

METROPOLIS, ILL.—The city of Metropolis expects to erect a concrete wall around the municipal electric-light plant for high-water protection in case of flood stage of the Ohio River. The State of Illinois will install concrete lamp standards in Fort Massas State Park in the near future and the city of Metropolis will maintain the lamps. P. M. Richards is superintendent.

NORTH CHICAGO, ILL.—A committee has been appointed by Mayor Christenson to secure estimates of the cost of building a municipal electric-light plant and report to the Council within 30 days.

ROCKFORD, ILL.—Plans are being prepared by Wernette, Bradfield & Mead, architects, for the construction of a new power plant for the tannery of the Hirth-Krause Co. in Rockford. The headquarters of the Hirth-Krause Co. are in Grand Rapids, Mich.

STREATOR, ILL.—Investigations, it is reported, are being made by the Public Service Co. of Northern Illinois, at Spring Lake, near Streator, with a view of establishing a new power plant there to cost approximately $250,000. Locations at Yorkville and Lacon are also under consideration.

BERLIN, WIS.—A fund is being raised by the citizens of Berlin for the purpose of installing an ornamental street-lighting system. The street-lighting service is furnished by the Berlin Pub. Ser. Co. S. W. Irwin is president of the company.

CLINTONVILLE, WIS.—Within the next 12 months the managers of the municipal electric-light plant expect to purchase one 16-in. by 36-in. Corliss engine, one 66-in. by 16-ft. boiler and one 300-hp. heater (open type), and within the next three months to purchase two switchboard integrating wattmeters, one recording voltmeter and one kilometer. George C. Stewart is superintendent.

NEENAH, WIS.—The city of Neenah is considering the question of establishing a municipal electric-light plant. As yet an engineer has not been engaged.

AURORA, MINN.—The Northern Minnesota Pwr. Co., of Aurora, will build a hydroelectric power plant on the St. Louis River, 2½ miles from Aurora. The equipment will include boilers with a rating of 600 hp, one 500-kva steam turbine, two waterwheels, two waterwheel governors, three 60-cycle, 2300-volt alternating-current generators, full switchboard equipment, synchronizer voltage regulator, eight transformers (2300 to 13,200 volts), 63 miles of wire and 800 poles, 2000 to 2300 ft. underground distribution, four three-phase meters; will also erect a substation in Aurora. J. H. Simons, of Aurora, is president.

CAMPBELL, MINN.—The Otter Tail Pwr. Co., of Fergus Falls, has submitted a propositon to the village of Campbell offering to extend its transmission line through Campbell and furnish electrical service here. The company asks for a ten-year franchise with the privilege of an additional five years; also contract for street lighting at $50 per month, for which it agrees to furnish 20 incandescent lamps, or four arc lamps and 12 incandescent lamps, or two arc lamps and 16 incandescent lamps.

GLENWOOD, MINN.—Negotiations are under way between Mr. Whalen and Mr. Claussen, of St. Paul, for the purchase of the property of the Glenwood Mill & El. Co. If the deal goes through, the new owners propose to rebuild the plant, replacing the direct-current system with alternating current. Messrs. Whalen and Claussen have applied for a 25-year franchise, which has been granted, with certain conditions.

MOUNTAIN LAKE, MINN.—At an election held recently the proposition to discard the present gas street-lighting system and install electric lamps was carried.

NASHWAUK, MINN.—The Water and Light Commissioners have entered into a contract with the Wisconsin Steel Co., which owns and operates the Hawkins Mine, for energy to operate the local system for a period of three years at the rate of 5 cents per kw-hr. A transmission line will be erected by the village from the plant at the mine, 2 miles distant, to the power house of the municipal electric plant, which will be used as a substation. The equipment of the plant will be held to use in emergencies. The village plant furnishes direct current, and the service from the Wisconsin company will be alternating-current system. Arrangements will be made so as to utilize either system as the

occasion may demand. The transmission line will carry 2300 volts, three-phase, 60-cycle, and will be stepped down to 110-220 volts. Contracts for switchboard, transformers, watt-hour meters, etc., have been awarded to the General El. Co., and for the other material to the St. Paul El. Co., of St. Paul. G. A. Lindsay is superintendent.

REDWOOD FALLS, MINN.—The Wherland El. Co., of Redwood Falls, expects to purchase within the next two months one 200-hp boiler, one 100-kw, three-phase, 60-cycle, 2300-volt generator, and one 150-kw generator, one 125-hp to 150-hp steam engine and one 150-hp oil engine; also complete switchboard with instruments. R. F. Wherland is secretary and manager.

ROCHESTER, MINN.—The contract for installation of a tandem compound non-condensing Corliss engine (2300 volts, 60 cycles) and a 120-volt exciter has been awarded to the Allis-Chalmers Co. of Milwaukee, Wis., at $11,585. A petition has been presented to the City Council asking for the extension of the cluster-lamp street-lighting system from Fifth Street to the Chicago & Northwestern Railroad tracks on Main Street.

STARBUCK, MINN.—The town of Starbuck has decided not to build a new steam plant and will use power from the old flour mill until an arrangement can be made to erect a transmission line to Glenwood and purchase energy from the new power plant there. A. H. Dryer is superintendent.

WOODLAKE, MINN.—Bids will be received by H. F. Payne, village recorder, until Sept. 25 for furnishing material and erecting an electric transmission and distribution system for the village of Woodlake in accordance with plans and specifications which are on file in the office of the village recorder and also in the office of Earle D. Jackson, consulting engineer, Capitol Bank Building, St. Paul, Minn. The work consists of erecting a 13,200-volt transmission line from Granite Falls to Woodlake and a distribution system in Woodlake.

BAGLEY, IA.—At an election held recently the proposition to issue $6,000 in bonds for a municipal electric-light plant was carried.

GLENWOOD, IA.—It is reported that the electric plants of the Glenwood El. Lt. & Pwr. Co., of Glenwood, and the Malvern Lt. & Pwr. Co., of Malvern will be connected. When the proposed connection is completed energy will be supplied to other towns in the county. The plant at Malvern will not be used except in case of emergencies. Energy for operating the system in that town will be furnished from the Glenwood plant. The companies will continue to do business under their own names.

LE MARS, IA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Oct. 22, for construction complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Le Mars. Drawings and specifications may be obtained at the above office or from the custodian of site at Le Mars. O. Wenderoth is supervising architect.

RIVERSIDE, IA.—Joseph Wingler, owner of the Riverside Roller Mill, it is reported, contemplates remodeling the mill, installing a larger waterwheel and furnishing electricity for lamps and motors in Riverside and to farmers in this vicinity.

VALLEY JUNCTION, IA.—At an election held Sept. 8 the proposition to grant the Des Moines El. Co., of Des Moines, a franchise to construct and operate an electric-lighting system in Valley Junction was carried.

WEST UNION, IA.—The City Council has voted to install ornamental lamps around the square and on Vine Street.

KING CITY, MO.—The King City El. & Mfg. Co. has recently purchased a 50-hp De Le Vergne oil engine, generator, extra switchboard panel, etc. As soon as improvements are completed the company will establish a 24-hour service.

KIRKWOOD, MO.—The Board of Aldermen has authorized the erection of 40 boulevard brackets in the business district, carrying 60-cp tungsten lamps. C. A. Trussell is superintendent of the municipal electric-light plant.

GRAND FORKS, N. D.—The lighting system will be extended along University Avenue to the campus. H. G. Lykken is city engineer.

WAKONDA, S. D.—The Wakonda Lt., Pwr. & Htg. Co. expects to purchase within the next two months a 50-hp two-cylinder oil engine and a 30-kw generator to replace a 30-hp engine and 18-kw generator. H. E. Dunn is manager.

AUBURN, NEB.—The proposition to issue $10,500 in bonds for the construction of a municipal electric-light plant will be submitted to the voters on Sept. 30.

COOK, NEB.—Bonds to the amount of $6,000 have been voted for the installation of a municipal electric-light plant and the erection of a transmission line to Tecumseh. Electricity for operating the system will be secured from the municipal electric plant at Tecumseh.

FRIEND, NEB.—The managers of the municipal electric-light and water-works plant expect to purchase within the next three months a 35-kw to 40-kw steam or oil outfit and one switchboard panel for above unit. The company would like to receive catalogs giving descriptions, etc., of 50-hp to 60-hp Corliss engine and oil engines. L. S. Frantz is superintendent.

WEEPING WATER, NEB.—The local electric-light plant and pumping station was damaged by fire on Sept. 6.

LARNED, KAN.—The City Council has engaged Worley & Black, consulting engineers, Reliance Building, Kansas City, Mo., to prepare plans and estimates of cost for installation of a municipal electric-light plant and improvements to the municipal water-works system.

WHITING, KAN.—At a special election held recently the proposition to issue $8,000 in bonds to erect a transmission line to Horton to secure electrical service from the municipal plant there was carried. Electricity will also be furnished to farmers living along the line.

## Southern States

GEORGETOWN, S. C.—Preparations are being made by the Georgetown Gas & El. Co., recently incorporated, for the construction of an electric-light plant and gas plant. Bids for the construction of plants, it is reported, have been asked by Bachman & Co., 624 Stock Exchange Building, Philadelphia, Pa., who control the company.

YORKVILLE, S. C.—The electric light, water and sewer commissioners expect to erect a substation near the center of the town within the next two months, using the equipment previously owned jointly by the town and the Neely Mfg. Co.; also to purchase within the next two months three automatic oil switches and panels. The Neely Mfg. Co. has placed orders for new transformers, etc. J. Q. Wray is superintendent.

TRION, GA.—The Trion Co. is installing a 750-kw steam turbine and one 300-kw generator, together with electrical equipment for lighting the village and mill. J. E. Sirrine, of Greenville, S. C., is architect and engineer. O. B. Carpenter is assistant treasurer of the Trion Co.

GREENSBORO, ALA.—The Greensboro Wtr. & Lt. Co., which has a water and electric-light plant about 1 mile from the depot and an ice plant at the depot, is contemplating removing the electric plant to the depot and installing electrically operated pumps and possibly new generating machinery.

COLUMBUS, MISS.—Bids will be received until Oct. 1 for the installation of an electric-light plant at the Mississippi Institute and College. For further information address D. T. Gaston, secretary and treasurer.

WELSH, LA.—At an election held recently the proposition to issue $15,000 in bonds for the installation of a municipal electric-light plant was carried. L. E. Robinson is chairman of light committee.

CHICKASHA, OKLA.—C. G. Johnson, receiver of the Chickasha Lt., Ht. & Pwr. Co., expects to sell the property to the Chickasha Gas & El. Co. some time this fall, permission having been granted by the State Legislature and the Corporation Commission. In anticipation of the consolidation the receiver is now installing additional equipment at a cost of from $35,000 to $40,000 as follows: One 625-kw General Electric steam turbine, one 2500-sq. ft. Worthington surface condenser with auxiliaries, including dry vacuum pump and turbine-driven circulating pump, one 325-hp Heine boiler, necessary switchboard and substation equipment for controlling the above installation and for tying together the water-power plant of the Chickasha Gas & El. Co. and the steam plant of the Chickasha Lt., Ht. & Pwr. Co.; also the erection of a transmission line with 900-kva transformers, 6600-2300 volt. The center of distribution of the new consolidated system will be the power house of the Chickasha Lt., Ht. & Pwr. Co. C. G. Johnson is superintendent of construction for the Chickasha Gas & El. Co. on this new work.

DALLAS, TEX.—At an election held recently the proposition to issue $400,000 in bonds for the installation of a municipal electric-light plant was defeated.

EAGLE PASS, TEX.—The International El. Co., of Eagle Pass, it is reported, will erect transmission lines to two irrigation pumping plants 9 and 16 miles respectively from Eagle Pass. The company also contemplates improvements to its plant, involving an expenditure of about $55,000, to increase its output.

FORT WORTH, TEX.—The North Side Improvement Association has petitioned the City Council for the installation of a new lighting system on North Main Street, from the new Baddock Bridge to Exchange Avenue, a distance of 2 miles. The cost of installing the system is estimated at about $28,000.

RUNGE, TEX.—We are informed that work will not begin before Jan. 1, 1914, on the proposed municipal electric-light plant, for which bonds to the amount of $20,000 were recently voted. As yet no engineer has been employed. J. F. Murray is clerk.

## Pacific States

SEATTLE, WASH.—J. D. Ross, superintendent of lights, is agitating the proposition of purchasing energy to the amount of 3000 kw from the city of Tacoma in order to meet the increasing demands for electrical service in this city. The municipal electric plant, located at Cedar Falls, is unable to furnish adequate service at this time. If it is decided to purchase energy from the Tacoma plant, a transmission line will be erected between Seattle and Tacoma, at a cost of $150,000.

SUMAS, WASH.—The Sumas El. Co., of Sumas, has applied to the towns of Everson and Nooksack for a franchise to furnish electricity for lamps and motors. Application has also been made to the County Commissioners of Whatcom County for a franchise to erect a trans-

mission line from Sumas to Everson. If granted a franchise, transmission lines will be erected from the Stave Lake plant in British Columbia.

WILBUR, WASH.—The Wilbur Electrical Co. has sold its property to the Washington Wtr. Pwr. Co., of Spokane, to take possession of same Jan. 1, 1914. Charles Kolb is manager.

FOREST GROVE, ORE.—The City Council has rejected the proposition of the Washington-Oregon Corpn. for street lighting and has decided to continue the municipal electric-light system. Arrangements are being made to install new equipment in the municipal electric plant.

MILTON, ORE.—The city of Milton expects to erect within the next 30 days series circuit for flaming-arc lamps and series tungsten lamps (54 in all). The city has purchased from the General El. Co. a 15-kw, 6.6-amp, 2300-volt constant-current transformer to handle the above street-lighting circuit. L. E. Coyle is business manager for the city of Milton.

PORTLAND, ORE.—A committee, consisting of Daniel Kelleher, M. O. Collins and others, has been appointed by the East Side Business Men's Club to investigate the question of establishing a municipal electric-light plant in Portland.

PORTLAND, ORE.—Bids will be received until Oct. 6 by the City Council for the installation of lighting fixtures at the new city hall. Plans and specifications may be obtained from Emil Schacht & Sons, architects, Commonwealth Building, Portland.

PORTLAND, ORE.—Bids will be received by William H. Daly, commissioner of public utilities, city hall, Portland, until Oct. 6 for lighting the streets, avenues, bridges, parks, public grounds, etc., with electric arc lamps and the buildings with incandescent lamps for a period of three years, beginning Jan. 1, 1913. Bidders may submit separate proposals for arc lamps and incandescent lamps. Plans and specifications are on file in the office of the commissioner, City Hall.

VALE, ORE.—Work will soon begin on the erection of the transmission lines of the Beaver River Pwr. Co., of Boise, Idaho, into this city.

HERMOSA BEACH, CAL.—Work will soon begin on the erection of a 20-ft. concrete walk along the ocean front to extend the entire length of the beach. The proposed walk will be illuminated by ornamental lamps erected in the center. The cost of the improvement is estimated at $35,000.

LOS ANGELES, CAL.—The City Council has voted to advertise for bids for street lighting for a period of two years, with the provision that 550 new lamps shall be furnished in 1914.

LOS ANGELES, CAL.—The Universal El. & Gas Co. has applied to the Board of Supervisors for permission to extend its pipe and conduit system to all parts of the city where the Pacific Gas & El. Co. has its mains. John F. Bowie, attorney, is representative for the Universal company.

LOS ANGELES, CAL.—The Pacific Lt. & Pwr. Corpn., of Los Angeles, has applied to the State Railroad Commission for permission to issue $52,300 in capital stock, to replace a previous issue of stock, and to issue $1,730,000 in bonds, the proceeds of $497,000 of these bonds to be used for refunding purposes, and the balance to be used in connection with the extensive hydroelectric projects of the company.

RICHMOND, CAL.—The installation of electroliers to replace the arc lamps along the main business thoroughfares is under consideration. It is proposed to have the property owners pay for the electroliers and the city maintain the lamps.

ST. HELENA, CAL.—The Napa Valley El. Co. has appled to the State Railroad Commission for permission to issue $15,300 in capital stock and $20,500 in bonds, the proceeds to be used for the purpose of paying off existing indebtedness and enlarging its system.

SANTA BARBARA, CAL.—The Santa Barbara Gas & El. Co. is negotiating with the residents of Goleta Valley for the extension of its electrical service to that suburb. John T. Huntington is manager of the company.

SUTTER CREEK, CAL.—The Amador El. Lt. & Pwr. Co., of Sutter Creek, has applied to the State Railroad Commission for permission to issue $12,000 in bonds and $3,000 in capital stock, the proceeds to be used for paying off existing indebtedness and making additions to its system.

BOISE, IDAHO.—The franchises and physical properties of the Beaver River Pwr. Co. in Idaho have been taken over by the Idaho Pwr. & Lt. Co. According to reports, extensive improvements and expansions are contemplated. An ordinance was recently introduced in the City Council covering the transfer of the Boise franchise of the Beaver River company to the Idaho Pwr. & Lt. Co.

GRANGEVILLE, IDAHO.—Messrs. Gustad & Hill, of Grangeville, are reported to be interested in a project which has for its ultimate object the construction of a transmission line extending along the Payette and Idaho Northern to furnish electrical service to towns along the line.

MOSCOW, IDAHO.—The Washington Wtr. Pwr. Co., of Spokane, Wash., through M. C. Osborn, commercial agent, announces improvements involving an expenditure of thousands of dollars, including extensions of transmission lines to furnish energy for lamps and motors in Troy, Kendrick, Juliaetta, Genesee and other smaller towns in that vicinity. The transmission lines will also be extended into the rural districts to furnish electrical service to the farmers.

SALT LAKE CITY, UTAH.—The commissioner of water works has drawn up a resolution to be submitted to the city commission recommending the installation of a municipal electric-light plant. It is proposed to include in the next year's budget at least $50,000 to start work on the installation of a municipal electric plant.

CASPER, WYO.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Oct. 24, for construction complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Casper, Wyo. Drawings and specifications may be obtained at the above office or from the custodian of site at Casper. O. Wenderoth is supervising architect.

GRAND JUNCTION, COL.—The city of Grand Junction has been granted a preliminary permit by the Secretary of Agriculture for a conduit on the Battlement national forest reserve in connection with the proposed hydroelectric plant to be built and operated by the municipality.

RYE, COL.—Investigations are being made with a view of developing the water-power in Greenhorn Creek to supply electricity for lamps and motors in Rye and surrounding territory. The present plans provide for 1000 hp to be distributed from Beulah on the north and Walsenburg on the south. A company will be organized under the name of the Rye Lt. & Pwr. Co., to be capitalized at $25,000, which will be increased as developments require. L. M. Adkinson, E. W. Spencer, A. Boisclair, A. W. Storms and H. H. Wilson are interested in the project. L. M. Adkinson is consulting engineer.

## Canada

MEDICINE HAT, ALTA.—The gas and electric commission of the City Council has decided to install cluster lamps in the business district and a lighting system in the outlying districts.

SOUTH VANCOUVER, B. C.—The Municipal Council is considering the question of establishing municipal electric-light and gas plants.

SYDNEY, B. C.—The British Columbia El. Ry. Co. is negotiating with the City Council for furnishing energy for lamps and motors in Sydney, and also for street-lighting in this city.

AMHERST, N. S.—The Canada El. Co., of Amherst, expects to erect within the next two months a new substation at Amherst and to double the size of its power house at Chignecto Mines; also to purchase one 100-kw turbo-generator, two Robb boilers, of 800 hp each, equipped with underfeed stokers, new switchboard for above extensions, and to erect a new transmission line from Chignecto to Amherst, a distance of 8 miles. N. T. Avard is superintendent.

HALIFAX, N. S.—The Halifax El. Tramway Co. has applied to the Board of Public Utilities for permission to issue $600,000 additional capital stock, the proceeds to be used to redeem outstanding bonds and for extensions, etc., to its system.

BARRIE, ONT.—The managers of the municipal electric-light plant have erected a 22,000-volt transmission line and installed step-down transformers with switchboard equipment and extra panels to care for increased loads this year. The Hydro-Electric Power Commission is now erecting a duplicate transmission line. The present arc-lamp street-lighting system is to be discarded and series tungsten lamps installed. J. A. Hare is superintendent.

PORT HOPE, ONT.—On Aug. 25 a by-law was carried authorizing the agreement between the Seymour Pwr. & El. Co., of Campbellford, and the town of Port Hope, under which the company will furnish street-lighting service, consisting of 340 tungsten lamps of 60 cp, at $12 each per year. The cost of installing the system is estimated at about $10,000.

ST. CATHARINES, ONT.—Estimates submitted by the Hydro-Electric Power Commission on an electric-light system to give the city the same service that it now has placed the cost at $90,000, and $26,000 for a street-lighting system. The proposition has been approved by the Council. A by-law authorizing the installation of the plant will soon be submitted to the ratepayers.

TORONTO, ONT.—Tenders will be received by H. C. Hocken, Mayor, chairman Board of Control, Toronto, until Sept. 23, for furnishing fire-alarm boxes, one ten-circuit protector board, one eight-circuit storage battery board, one motor-generator set, three full joker sets, copper wire, etc. Specifications and form of tender, together with conditions governing tenders, may be obtained at the office of the Fire Department, 152 Adelaide Street, West Toronto.

REGINA, SASK.—Tenders will be received by the city commissioners, Regina, Sask., until Oct. 25 for furnishing one 3000-kw steam turbine and one 25-ton hand-power crane for 45-ft. span. Specifications may be obtained from E. W. Bull, superintendent of Light and Power Department.

## Miscellaneous

PANAMA—Bids will be received at the office of the general purchasing officer, Isthmian Canal Commission, Washington, D. C., until Oct. 4 for furnishing chain, wire cable, track spikes, rivets, bolts, etc., Blanks and general information relating to this circular (No. 799) may be obtained at the above office or at the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and 1086 North Point Street, San Francisco, Cal. F. C. Boggs is general purchasing officer.

## New Incorporations

GALESBURG, ILL.—The Galesburg Ry., Ltg. & Pwr. Co. has been incorporated with a capital stock of $50,000 by W. H. Carnahan, H. J. Vance and E. W. Fowler. The company proposes to furnish energy for lamps and motors, etc.

LOCUST GROVE, OKLA.—The Cherokee Lt. & Fuel Co. has been chartered with a capital stock of $15,000. The incorporators are: E. E. Atherton, J. M. Conner and E. R. Wilson, all of Tulsa.

JOHNSTOWN, PA.—Charters have been granted to six companies to operate in Somerset County. The companies are named for the districts in which they will operate, as follows: Summit, Milford, Lincoln, Elklick, Black and Brothers Valley Townships. Each company is capitalized at $5,000, and the incorporators are: H. H. Weaver, P. J. Morrisey and W. A. Reber, all of Johnstown. The headquarters of the companies will be in Johnstown.

PITTSBURGH, PA.—Charters have been granted by the State Department to 29 electric companies to operate in Greene, Armstrong and Washington Counties. Each company is capitalized at $5,000, and the incorporators are: E. B. Beach, C. G. Hamilton and J. McC. Reed, of Pittsburgh; H. B. Smith, of Edgewood, and R. C. Lightcap, of Mount Olive Borough. The companies are named for the districts in which they are to operate as follows: Hanover, Hopewell, Independence, West Finley, East Finley, Jefferson, Cross Creek, Clarksburg, Deemston, Cokeburg, Claysville, Beallsville, Long Branch, Ellsworth, Marianna, Wickboro, West Kittanning, Parkers Landing, Applewold, Washington, Perry, Madison, North Buffalo, Hovey, West Franklin, Boggs and Brady's Bend El. companies. The offices of the companies will be located in Pittsburgh.

# Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED SEPT. 9, 1913.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York.]

1,072,422. ELECTRIC CONTROLLING APPARATUS; J. Burke, Erie, Pa. App. filed Oct. 9, 1907. For starting induction motors; transformer windings connected in star.

1,072,426. INDICATING DEVICE; C. R. B. Claflin, Boston, Mass. App. filed May 11, 1908. For flashing numbers or words; all the signal lamps are arranged to direct their images upon the same portion of the field.

1,072,440. MOTOR-CONTROL SYSTEM; G. T. Eagar, Ballston Spa, N. Y. App. filed June 9, 1910. Current to actuate the accelerating means is automatically cut out upon complete operation of such means.

1,072,443. VAPOR ELECTRIC APPARATUS; S. Ferguson. Schenectady, N. Y. App. filed May 14, 1904. The number of vapor rectifiers in circuit is varied according to the load.

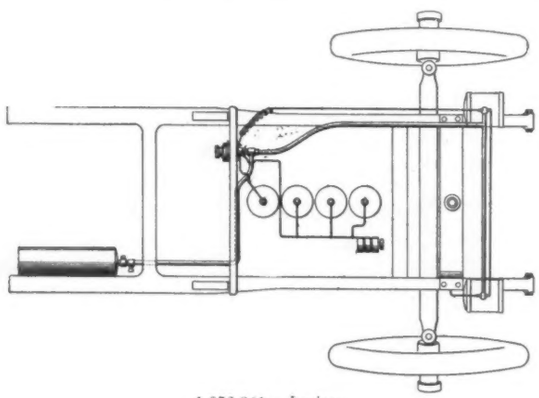
1,072,445. ALTERNATING-CURRENT-MOTOR CONTROL; V. A. Fynn, St. Louis, Mo. App. filed May 13, 1912. Automatically reorganizes the circuits of a single-phase motor when speed falls below or exceeds a certain value.

1,072,459. SUBSTATION SELECTIVE APPARATUS; O. B. Hjorth, Sandwich, Ill. App. filed July 18, 1912. Dispenses with all time elements, and system may be operated by ordinary keys and switches should central-station mechanism become inoperative.

1,072,460. PLUG-SOCKET ELECTRICAL CONNECTOR; W. F. Hoffmann, Detroit, Mich. App. filed Oct. 30, 1912. Plug is guided in a socket and quick breaking of the circuit is insured by a spring device which positively ejects the plug from the guide socket.

1,072,462. OUTLET BOX; W. H. Hope, Newark, N. J. App. filed Sept. 26, 1911. Has "knock-out" closures and adjustable clamps for the cables.

1,072,507. VALVE OR THE LIKE; O. A. Ross, Chicago, Ill. App. filed June 19, 1907. Electropneumatic valve, particularly for the fluid-pressure systems for signaling and train-stopping devices.



1,072,961.—Igniter.

1,072,511. DYNAMO-ELECTRIC APPARATUS FOR FIRING MINES; K. Schaffler and R. Glössl, Vienna, Austria-Hungary. App. filed Feb. 4, 1913. Dynamo is operated by a spring and apparatus can be operated only when the actuating spring has been completely wound up.

1,072,513. ATTACHMENT FOR TELEPHONE TRANSMITTERS; E. M. Schollenberger, Chicago, Ill. App. filed Sept. 12, 1912. Sound-confining casing attached to transmitter mouthpiece.

1,072,523. INSULATOR; L. Steinberger, Brooklyn, N. Y. App. filed May 18, 1910. Molded insulator base with upstanding binding posts.

1,072,524. INSULATOR; L. Steinberger, Brooklyn, N. Y. App. filed Sept. 21, 1910. High-potential suspension insulator. (Thirty-three claims.)

1,072,525. SUSPENSION INSULATOR; L. Steinberger, Brooklyn, N. Y. App. filed Sept. 21, 1912. Alternate horizontal and vertically disposed separately formed suspension units in vertical column.

1,072,530. ELECTRIC HEATER; E. Thomson, Swampscott, Mass. App. filed Feb. 16, 1912. Electric arc in connection with a heat-storage mass.

1,072,531. ELECTRICAL MEASURING INSTRUMENT; R. L. Triplett, Bluffton, Ohio. App. filed Nov. 28, 1910. Pocket type of voltmeter or ammeter; the active parts are assembled in fixed and predetermined relative positions.

1,072,537. INDIVIDUAL TELEPHONE MOUTHPIECE; C. S. Warren, Milford, Ohio. App. filed April 13, 1912. A series of individual telephone mouthpieces supported on the transmitter and adapted to be swung down into operative position.

1,072,540. CONTACT DEVICE; J. J. H. W. Weenen, Amsterdam, Netherlands. App. filed Nov. 23, 1912. "Point" or signal controlling apparatus for tramways.

1,072,551. ELECTRIC BATTERY; D. H. Wilson, Chicago, Ill. App. filed Sept. 18, 1905. Single positive electrode and two carbon electrodes, both ends of the carbon electrodes projecting through the receptacle.

1,072,561. TERMINAL CONNECTOR FOR SPARK PLUGS; C. W. Beck, Rockville Center, N. Y. App. filed Oct. 15, 1910. Has a switch and a pair of supplemental visible sparking points by which the proper working of the switch can be determined.

1,072,567. ELECTRIC SIGNALING ON RAILWAYS; H. Brown, Belfast, Ireland. App. filed Dec. 29, 1911. Cab-signaling system of ramp-rail type.

1,072,595. HEATER FOR AUTOMOBILE RADIATORS; W. Gallaher, St. Louis, Mo. App. filed April 28, 1913. Electric heater unit disposed in lower portion of the radiator which may be plugged in circuit.

1,072,614. METHOD OF ELECTRICALLY WELDING CHAIN LINKS; W. H. Hodges, Lynn, Mass. App. filed June 9, 1908. A large amount of the metal is forced into the weld and surrounding parts to reinforce the welded portion.

1,072,647. DYNAMO-ELECTRIC MACHINE; A. A. Pifer, Cleveland, Ohio. App. filed Oct. 14, 1908. Variable-speed motor with shiftable pole shoe sections.

1,072,656. MOTOR CONTROL; G. B. Schley, Milwaukee, Wis. App. filed July 22, 1911. For rolling mills, hoisting machinery, etc.; current in motor armature is automatically decreased if such current exceeds a predetermined value. (Eighty-eight claims.)

1,072,685. VAPORIZER; G. A. Arnold, Middletown, Conn. App. filed March 24, 1913. Has electric heating units of progressively decreasing intensity.

1,072,748. ELECTRICALLY HEATED BOILER; J. F. McElroy, Albany, N. Y. App. filed Sept. 16, 1908. To provide steam heat when steam locomotive is taken off and electric locomotive is coupled to a train; electrically heated boiler provided with air flues, this boiler being carried by the electric locomotive.

1,072,847. BUFFER; D. D. Gordon, Chicago, Ill. App. filed June 28, 1910. Portable-type, inclosed motor.

1,072,898. ELECTRIC SWITCH; E. Anderson, Bridgeport, Conn. App. filed April 21, 1913. Oscillating make-and-break mechanism for lamp-socket switch.

1,072,913. CHANGE SPEED GEAR; A. T. Collier, St. Albans, Eng. App. filed Feb. 18, 1913. Has plurality of magnetic clutches.

1,072,961. IGNITER; G. B. Lambert, New York, N. Y. App. filed June 12, 1912. For automobile head lamps; combined fuel valve and igniting means.

1,072,996. ELECTRIC LOCK-STRIKE; F. F. Schneider, Ridgefield, Conn. App. filed May 27, 1913. For releasing the door lock from a remote point.

1,072,999. TUBULAR INSULATOR; G. Simcoe, Trenton, N. J. App. filed Oct. 1, 1912. Has a pair of longitudinal openings to receive the loop of a cable or wire.

1,073,018. SIGNALING AND TELEPHONE SYSTEM FOR RAILROADS; W. J. Bailey, Cedarville, W. Va. App. filed Dec. 18, 1912. Uses track rails and a conductor alongside the track.

1,073,023. ELECTRIC SWITCH; J. M. Blain, Spring City, Utah. App. filed July 20, 1911. Has bridge piece for independently controlling either one of two circuits or both, at will.

1,073,024. ELECTRICAL SIGNALING DEVICE; C. L. Bopp, Waterloo, Ia. App. filed Sept. 8, 1911. Signal switch operated by deflection of a rail when train passes over same.

1,073,044. ELECTRIC ATTACHMENT FOR KEYBOARDS OF AUTO-PLAYERS; O. Herrmann, New York, N. Y. App. filed May 13, 1912. Electric bell-ringing attachment.

1,073,047. ELECTRIC SWITCH; M. L. Hubermann, Los Angeles, Cal. App. filed March 30, 1912. Float-actuated tank switch.

1,073,059. METHOD OF MAKING COILS; R. Varley, Englewood, N. J. App. filed Oct. 14, 1911. Preserves the symmetrical superposition of the layers of windings under all conditions of manipulation and use.

1,073,060. ELECTRIC COIL; R. Varley, Englewood, N. J. App. filed Oct. 14, 1911. Produces a coil of compact form and symmetrical shape.